THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[Registered as a Newspaper.]

Vol. XXXI. No. 785.] LONDON, MAY 28, 1878. [30th Year.] Price 6d.

COMPLETION of the FIRST VOLUME OF

KING'S TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

[*For detailed announcement, see page* 848.]

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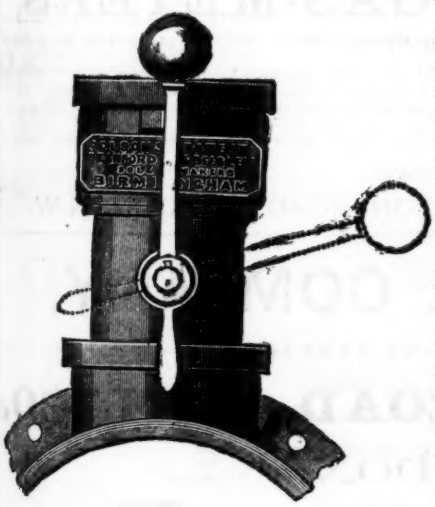

THIS Valve is designed to supersede the hydraulic seal, and is intended to be placed immediately in or on the retort mouthpiece, or at such a distance therefrom as to be within reach of the workman. By the use of these Valves, the whole of the pressure is removed from the retorts, and a largely increased make of gas per ton obtained; the deposit of carbon is very slight, choked ascension-pipes are unknown, and the quality of the coke is improved.

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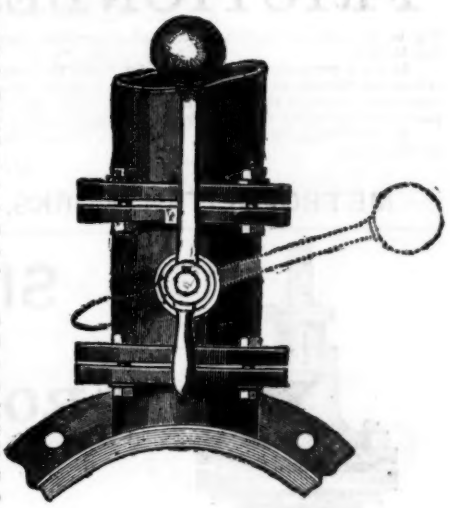

Upwards of one hundred of these Valves have been continuously at work during the past six months at the Windsor Street Works of the Corporation of Birmingham, and no difficulty has been experienced in working retorts fitted with them in combination with others worked in the usual way with the hydraulic seal.

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Corporation of Birmingham Gas Department, Windsor Street Works, Feb. 17, 1878.

MESSRS. STANFORD AND BEESLEY.

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Yours truly, (Signed) CHARLES HUNT.

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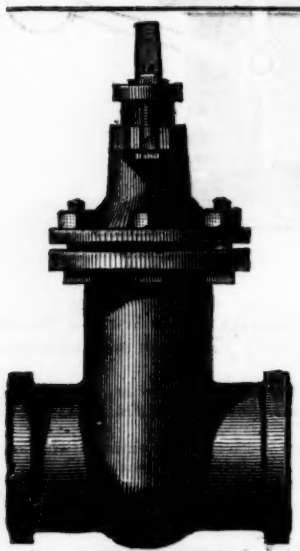

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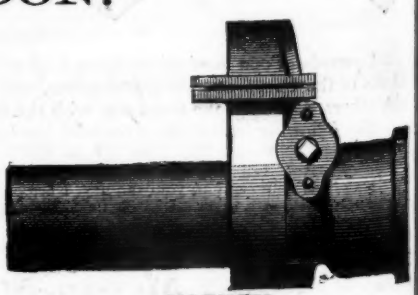

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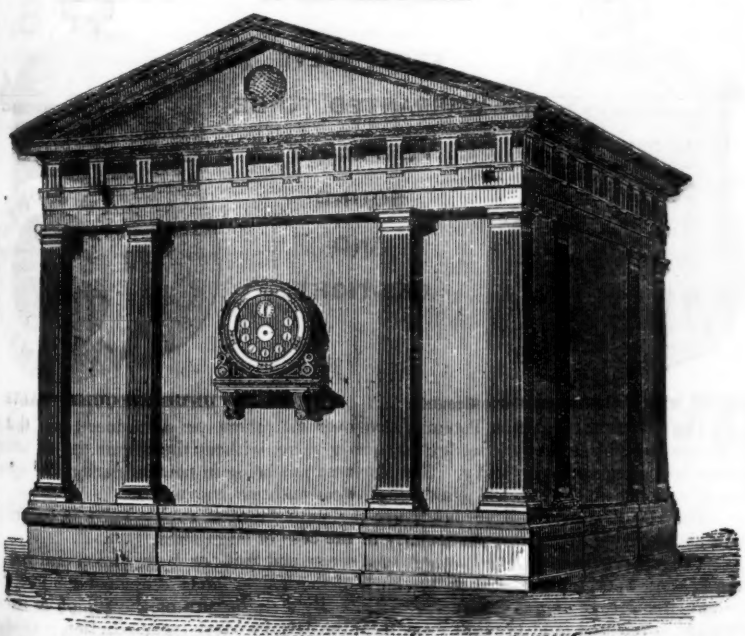

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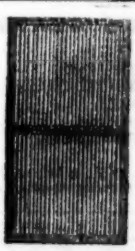

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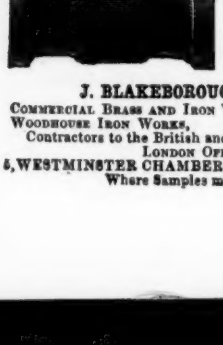

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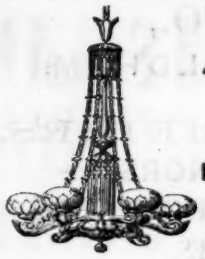

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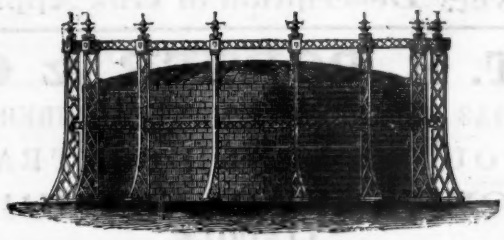

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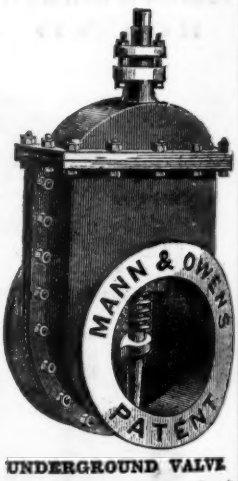
6, WESTMINSTER CHAMBERS, VICTORIA STREET,
GAS ENGINEERS, IRONFOUNDERS, &c.,
MANUFACTURERS OF
GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED, LAMP-POSTS, PIPES,
AND ALL REQUISITES FOR EITHER
GAS OR WATER WORKS;
ALSO
MAKERS OF ROOFS, BRIDGES, &c.

MANN & OWENS' PATENT GAS-VALVE.

EVERY VALVE WARRANTED TO BE PERFECTLY SOUND AND GAS-TIGHT.



VALVE, with Indicator or Above Ground. UNDERGROUND VALVE

The advantages of this Patent Valve over all others yet introduced are, that it is always as tight as the best wedge or spring valve, without the possibility of setting fast or becoming suddenly leaky. The surfaces not being in contact during the operation of opening or closing, leakage through wear and tear is avoided.

The Gas Engineer will not fail to see the importance of such a valve in connexion with his purifying apparatus, particularly in the case of large sizes.

The slide being operated either by a screw and nut, or by a pinion and rack, a cam bearing upon a plane, cast on the back of the Valve, forces it against the face, and renders the escape of gas an impossibility. By a slight turn of the pinion or screw, the slide is released, and brought away from the face, by which means friction is avoided, and the only force required to open the Valve is that due to its own weight.

SOLE MANUFACTURERS:
S. OWENS AND CO.,
HYDRAULIC AND GENERAL ENGINEERS,
WHITEFRIARS STREET, LONDON, E.C.
PRICES, SIZES, AND FULL PARTICULARS ON APPLICATION.

TANGYE BROTHERS AND HOLMAN,

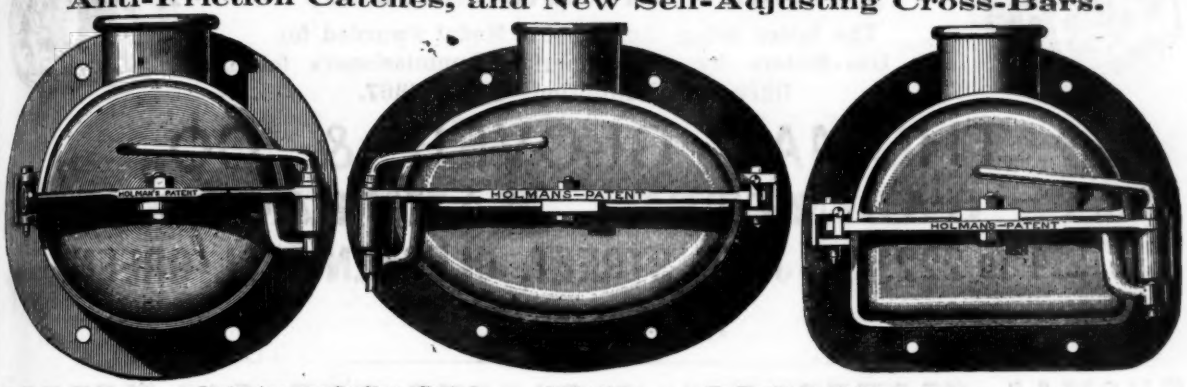
CORNWALL HOUSE, 35, VICTORIA ST., LONDON, E.C.

(LATE OF 10, LAURENCE POUNTNEY LANE.)

SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,

Anti-Friction Catches, and New Self-Adjusting Cross-Bars.



Instantaneous Sealing effected. No Luting. No Duplicate Lids required.
Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.

Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested, being now in use in nearly all the principal Gas-Works in London and the Provinces.

T. B. and H. are now making the "Morton's Self-Sealing Lid" of the SAME FORM OR SECTION AS THE RETORT (see Illustrations above), as well as bringing the Mouthpiece from the D or Oval at back to Circular in front, as heretofore.

D and Oval Morton's Lids are working satisfactorily both in this country, on the Continent, and in the United States of America. Among others they have been adopted by the following Gas-Works:—

The Gaslight Company's Works, Fulham; Ditto, Bromley-by-Bow; Ditto, King's Cross; Ditto, Shoreditch.
And also in the Gas-Works at Richmond, Maidstone, Gloucester, Glasgow, Portsea, Roubaix (France), The Hague (Holland

HUNT'S PATENT EQUILIBRIUM GAS-GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at an convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.

These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight and Coke Co. (9), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1878.

MESSRS. TANGYE BROTHERS AND HOLMAN.

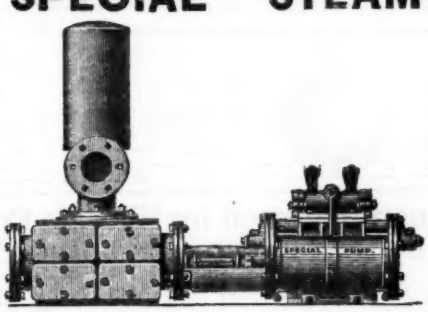
Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

Yours truly,
(Signed) JOHN JOHNSON.

PRICES AND FULL PARTICULARS ON APPLICATION.

THE "SPECIAL" STEAM-PUMP.

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons of Water per Hour, Approximate.	Reduced Prices.
3	1½	9	450	£16
4	2	9	815	18
5*	2½	12	1,250*	20
5*	3	12	1,830*	22 10
4	4	12	3,250	25
6*	4	12	3,250*	30
5	5	12	5,070	32 10
7*	5	12	5,070*	40
6	6	12	7,330	40
8*	6	12	7,330*	50
7	7	12	9,750	50
10*	7	12	9,750*	65



In use in a Hundred Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.

Messrs. Burt, Boulton, and Haywood, Manufacturing Chemists, have over FORTY "Special" Steam-Pumps in use at their several large Tar-Works.

Two Hundred Sizes made. Those in Table opposite are the leading Sizes for use in Gas-Works and Chemical Works.

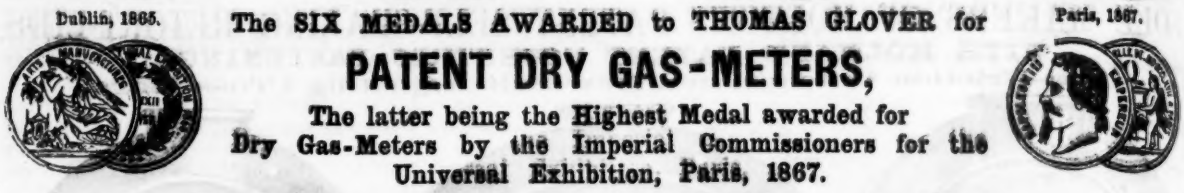
* These Sizes being usually selected for pumping Tar and Liquor, are always in stock, or nearly ready, fitted with all pump details in iron, and extra length distance-piece between steam and pump cylinder, at a small extra cost.

TANGYE'S HIGH-PRESSURE AND CONDENSING STEAM-ENGINES; CORNISH, VERTICAL, & TUBULAR BOILERS; HYDRAULIC AND SCREW LIFTING-JACKS, CRABS, PULLEY-BLOCKS, &c.

FULL PARTICULARS, ESTIMATES, CATALOGUES, ETC., ON APPLICATION.

London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris, 1867.



The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

LONDON, E.C.

THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS,

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON & CO.

(ESTABLISHED 1816)

ARE THE ONLY MAKERS

OF THE

LOW-PRESSURE WATER-METER.

These Meters will register with perfect accuracy, either at full speed, or with a few drops only passing through them.

They must be placed over the cistern to be supplied, and the water, after being measured, will fall from the outlet into the cistern below. Each Meter is fitted with a ball-valve, so made that it can be adjusted to shut off the supply at the inlet when the water reaches any required height in the cistern.

The 100-gallon Meter is fitted with a cistern holding about three or four gallons, and may be fixed inside a house, free from the effects of frost, and requires no attention after once being fixed.

From "The Engineer," April 6, 1877.

"Low-pressure Meters have been found to register with almost perfect accuracy, or, at all events, within 5 per cent. either for or against the consumer, and from the nature of their construction are by no means easily deranged. Still, even the low-pressure meters have their disadvantages, but these are chiefly as respects the question of first cost, seeing that they must have a cistern fixed at a higher level than that at which the supply is needed. All things considered, however, the balance of opinion rules at present in favour of the low-pressure Meter, and they are consequently increasing in favour as time goes on."

These Meters have been manufactured by W. P. & Co for more than 25 years and are largely used by the following and other Water Companies:—

NOTTINGHAM, DERBY, LEICESTER, SUNDERLAND, GREAT YARMOUTH, SHEFFIELD, NORWICH, LOWESTOFT, COVENTRY, SOUTHEND.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MAY 28, 1878.

Circular to Gas Companies.

Those of our readers who perused the report and accounts of the Paris Gas Company will have observed one item in the expenditure which deserves notice—"To cost of experiments, &c., £1078." What the *et cetera* includes, we do not know; but the Paris Company every year expend money, which appears in their accounts under this head. It would, of course, be wrong to conclude that English Gas Companies make no experiments because no charge for them appears in their accounts. We know, as a matter of fact, that experimentation is always going on in many of the Metropolitan works. Every Manager has his own ideas on some matters, and endeavours to establish their correctness. He is also frequently pestered with the ideas of other people, who have inventions they wish to have tried. It is but right to say that Directors, as a rule, countenance these efforts at progress, and seldom refuse the money wanted. It would, however, be well if the experiments made were of a systematic and less desultory character. There are many points in the process of gas-making which require elucidation, and for this, close and continuous observation would be necessary. It is seldom within a Manager's power, so multifarious are his duties, and so incessant are the calls on his attention, to give the superintendence which is necessary when experiments are being carried on. Moreover, plant cannot be disarranged in the works for the substitution of experimental apparatus. Thus, investigations conducted, as we may say, during the ordinary course of business, become difficult to make. It would be highly desirable if we could have some works devoted entirely to experimentation. We rather think the Paris Company have, at one of their stations, a small apparatus for the purpose, and the importance of this to the Company can hardly be over-rated. The Paris Company possess also an immense advantage in having for their Vice-President M. H. Sainte-Claire Deville—a man almost unrivalled as a chemist and physicist. We can easily imagine that the experiments to which he lends his countenance and contributes his suggestions must be of great value. The £1078 were, no doubt, well spent last year, and with useful results.

There is one thing which would stand in the way of some Metropolitan Gas Companies expending money for experimental purposes. An Official Auditor might, perhaps, object that the cost for them was not ordinary expenditure, and might require that the charges should be defrayed out of profits applicable to dividends. We do not say that this would happen; but it certainly would, if the Metropolitan Board of Works had their way. Apart, however, from all such considerations, we should be very glad to see the example of the Paris Gas Company followed, and money avowedly devoted to scientific investigation. It would soon bear fruit, which must ripen to the advantage of the Companies. It is within the power of any one Company to experimentalize for themselves; but the benefit would be infinitely greater if all combined in such an enterprise. One of the best results of a general amalgamation might be found in the opportunities it would afford for the furtherance of a scientific knowledge of gas-making. There is a very large field open to investigators, and a few thousands a year might be usefully spent in this direction.

We are rather disappointed that the subject of the heat of gas in ascension-pipes has not brought to our columns the observations which must have been made by many Managers. The subject is one of much practical importance, and we cannot help thinking with Mr. Newbigging, that when attempting to determine the heat of the gas three inches from the mouthpiece, Mr. Paterson really estimated the temperature of something more than gas. Clegg was a very careful experimenter, and we have little doubt that he could give good reasons for the truth of his statement; but it is a misfortune that he has not left on record the exact mode by which he made his determination. If a tube were passed through the lid of a retort, and pushed, say, a little beyond the mouthpiece, and the temperature of the gas taken immediately as it issued from the orifice of the tube into the air, we think Clegg would be found to be correct, and we have an idea that this was the way in which he made his experiment. The temperature of gas in an ascension-pipe may be a different matter. The experiments made at Manchester, at Mr. Newbigging's suggestion, are conclusive as to the heat of gas at the top of the ascension-pipe, and it seems that, at this point, the temperature closely agrees with that given by Clegg, as the heat of the gas issuing from the retort. It is known, however, that the heat rapidly diminishes as the distance from the retort is increased. To descend, however, from 653° Fahr. to a temperature at which gas might be safely admitted to the hydraulic, in the space of a few feet, would seem unlikely. We may just remark here that Messrs. Evans and Sugg require to coat the ascension-pipes with a non-conducting material, in order to get the gas to the hydraulic at a temperature of about 200° Fahr. We mention this matter as one point which might engage the attention of Gas Managers, if Companies and Corporations would encourge them in making investigations. There are very many others requiring elucidation, but we shall not here refer to them.

Mr. Wm. White, of Abersychan, is rather angry with us for not having bestowed more notice upon his automatic valve which is to dispose of the necessity for a dip, and also of the arrangement by which he proposes to dispense with the use of the hydraulic. Without agreeing with Mr. White in all he says of the evils resulting from the dip, we may at once grant that it would be advisable to get rid of it; and the automatic valve offers the means. The advantage of the arrangement seems to be that the retort is relieved of pressure, and, consequently, less carbon is deposited. The inference is that the gas is richer in illuminating power, which is, no doubt, the fact. Here is another matter which is worthy of investigation.

Perhaps we ought to apologize to our readers for once more calling their attention to a process for the manufacture of gas, devised by Mr. Stephan, of Worcester, and which has, we are told, been patented all over the world. We have now the specification before us, and a copy of it will be found in another column. Probably our readers will agree with us in thinking that nothing more grossly absurd is to be found even in the records of the Patent Office. The account we recently gave of it is, we find, substantially correct, but in the specification appear evidences of ignorance for which we did not give the author credit. He proposes, as our readers will see, to make oxy-hydrogen gas, and he professes to obtain his oxygen by acting on the oxide of iron formed when steam is decomposed in his metallic chamber by any suitable acid. What acid will separate pure oxygen from sesquioxide of iron we do not know, nor, we fancy, does Mr. Stephan. Having obtained his pure oxygen, he proceeds to mix it with hydrogen, and, apparently innocent of the fact that he has now an explosive mixture, he proposes to distribute it for illuminating, or at all events for combustible, purposes. We have already informed our readers of his proposal to obtain illuminating matter from sewage, but until we read his specification, we were unaware of an important fact, of which no mention has been made in the numerous puffs published respecting his system. Before Mr. Stephan could obtain patrons—and we learn he has many

and wealthy ones—he must have exhibited something which gave a good light, a light that could not be obtained by any treatment of sewage deposit. In his specification probably the truth comes out. In the place of sewage he may employ lumps of chalk saturated with petroleum, coal, coal dust, and even creosote. Of course, by the use of these agents some luminosity may be communicated even to a mixture of hydrogen and carbonic acid. It is remarkable that Mr. Stephan's friends announce that the great source of profit is in the residuals, which are said to be of so much value that a "Corporation could afford to distribute the gas gratis, and pay "all the rates by the sale of residual products." Where these latter are to come from it is difficult to see. A burnt sewage deposit would leave nothing but some carbonaceous dust, which would be of no money value whatever. Lumps of chalk saturated with petroleum, would, when heated, become mere lumps of chalk again. Creosote, if distilled off, might give up a little tarry matter. Bones, when burnt, give off some foul oil, which is worthless, and leave a residue of bone ash, which is worth not quite so much as the original green bones. We are then, as we say, quite at a loss to see the source of the large profit which Mr. Stephan proposes to make. It would not be necessary to notice nonsense such as this, if it were not a fact that the process is attracting a good deal of attention in the Midland Counties, and we are told that a trial of it is to be made by the Corporation of Birmingham. We do not believe the story, for we feel certain that the able Engineers of that Corporation would decline to recommend their employers to give a trial of a scheme so preposterously absurd. The next thing in connection with it that we expect to hear of is a Limited Liability Company, with a large capital. It is rather late in the day now for gas schemes, but there are no limits to human credulity and cupidity. The times, however, are not propitious for schemers, and, perhaps, before money is again plentiful, it may be discovered that rich illuminating gas cannot be procured from limestone and sewage, and that a gas given away, with a profit of 150 per cent. on residuals, is all moonshine.

Water and Sanitary Notes.

Last Thursday evening Sir J. M. Hogg seized the first opportunity afforded, and withdrew the Water Works Purchase Bill promoted by the Metropolitan Board of Works. The Supply Bill will follow to limbo in due course. The excuse, naturally, was the late period of the session, and the impossibility of getting the measures through the two Houses during the present year. Our readers will, however, understand that the opinion of the House of Commons, and, we believe, the House of Lords, was distinctly antagonistic to the proposals of the Board. There was not this, and we venture to predict there will not be in any coming, session, a disposition on the part of the Legislature to enlarge the powers of the Metropolitan Board so far as to give them the control of the water and the gas supply. It is freely recognized that the Board have already too much on their hands. They have obtained powers to effect various improvements, all highly desirable; but nothing is done, and, in some instances, we are told that nothing can be done for years. These things only bring obloquy on those who have been too ambitious, and have projected improvements far beyond their means to execute. If it be beyond their power to effect the comparative small improvements involved in the construction of new streets, and the new buildings under the Artisans Dwellings Act, it must be sheer impertinence which prompts them to assume the duty of supplying the Metropolis with water, which would land them in an outlay of from £26,000,000 to £30,000,000.

The letter of the Prince of Wales to the Society of Arts, respecting the water supply of the kingdom, has had its natural outcome in a conference in the Adelphi, which was appropriately presided over by Sir H. Cole, C.B., who probably prompted the letter signed "Albert Edward, P." The second day of the meeting was devoted to a consideration of the sources of the water supply of the Metropolis, and we are somewhat astonished to find that Dr. Frankland defends the supply of unfitered water from the Thames for everything but dietetic purposes. He was wont to quarrel with the hardness of Thames water, as objectionable for laundry and manufacturing purposes; and, if we remember rightly, recommended the softening of Thames water before it was used. Caught by the scheme of Messrs. Bramwell and Easton, Dr. Frankland recommends a dual supply, but thinks that the two should come from the same source. If we understand him rightly, he would have the small quantity of water required for dietetic purposes very carefully filtered (say, through spongy iron), while water for other than dietetic purposes might be taken at London Bridge, and used after having been allowed to settle for forty-eight hours. Dr. Frankland appeared to think that servants would not sufficiently discriminate between the hard supply taken into the house under the plan of the Metropolitan Board of Works, and the ordinary supply furnished by the Companies. We fancy the same difficulties would be found if his indoor and outdoor system were brought into operation. We quite agree with him, that the greater part of the water furnished to the inhabitants of the Metropolis is wasted. Ten gallons per head is quite sufficient for all purposes of domestic supply. It would be an immense advantage if we could have water supplied by meter; but, at the present time, that is impossible. We still lack a water-meter which can be used to measure domestic supply, and if Dr. Frankland's plan were set on foot, it seems that we should require two meters for every house. A conference of this kind naturally calls out many projectors. So, last week, we had Mr. Homersham, with his scheme of supplying the Metropolis from chalk wells, which may some day be considered when London has outgrown its present sources. Less likely to be seriously entertained is the plan of Mr. Hassard, C.E., who once more comes forward with his plan of bringing water to London from the Cumberland Lakes. We take no notice of the discussion of the action of lake water on leaden pipes and cisterns, since the water of Ullswater Lake contains lead in solution sufficient, it is said, to produce symptoms of poisoning. The physical difficulties in the way of bringing water from Cumberland to London would be easily surmounted, but the objections to such a scheme are patent to every one, the more so as close around are sources which may be deemed illimitable. Mr. Austin's, C.E., design of wells sunk in the lower greensand of London, at a depth 1800 or 2000 feet, looks well upon paper, but, unfortunately, recent experiments do not encourage the notion. Mr. Prestwich correctly pointed out that underground water is liable to the same sort of contamination as surface waters. Until recently, indeed, we have been in the habit of reading of "previous sewage contamination" in the water from deep chalk wells.

We need not follow the proceedings further than to mention the outcome, which was a resolution urging upon the Government the necessity of appointing a small permanent Commission to investigate and collect the facts connected with the Water Supply in the various districts throughout the United Kingdom.

Our readers know the strong objection we entertain to all Commissions of this kind. It would be easy, of course, for any one to select the Members at once, and to indicate the character of the reports to be written. Any such Commission, however, would seem, to a great extent, to be rendered unnecessary by a return which has been ordered by the House of Commons, on the motion of the Marquis of Stafford. This return is to give the following information, viz:—

The means by which drinkable water is supplied to every city and town in England and Wales, such means being provided by public or private arrangements. The return should state for each place—

1. The name and population;
2. The source from which water is supplied;
3. The arrangements made for the supply, by reservoirs, wells (artesian or otherwise), rivers (if filtered or not), or any other arrangements;
4. Amount of daily supply, and whether or not the supply is sufficient;
5. Whether the supply is constant or not, and the quantity used daily;
6. The geology of the district;
7. The rateable value of the district;
8. What has been the cost of works;
9. The annual charge per head of the population;
10. Under what Act of Parliament or other authority the works have been executed;
11. If any and what improvements are considered necessary.

The above return will apply only to urban districts, and the great outcry of the present day is for an effective supply to rural populations. This is a very difficult question, and we doubt whether a small permanent Commission would greatly help in the matter; but, after all, considering how public money is wasted on unworthy objects, we should not be dissatisfied to see the appointment of a Chemist, an Engineer, and a Geologist, who would write big Blue Books if they did nothing else.

The profitable utilization of sewage we still regard as an unsolved problem, notwithstanding Mr. R. W. Peregrine Birch, who comes forward with a pamphlet giving fifty instances of profitable sewage irrigation.* Profitable the employment may be to farmers who obtain the sewage for nothing, or next to nothing; but the profits promised to ratepayers have never been forthcoming, and, we fear, never will be. We must content ourselves with commending this

* "The Use of Sewage by Farmers; or, Fifty Instances of Profitable Sewage Irrigation." By R. W. Peregrine Birch. London: Spon and Co. 1878.

book to the perusal of all our readers who are interested in the utilization of sewage. With much that is put forth by the writer we cannot agree; but we are quite willing to admit that sewage, at proper times, and in quantities limited to the strict requirements of the land and the crops grown, may be very usefully employed. The enthusiast who dreams of disposing of the sewage of a town at all seasons of the year, will, we fear, be dreadfully disappointed; for, as a matter of fact, but little is required, and at irregular intervals, to fertilize the land and to stimulate the growth of crops. Speaking broadly, perhaps, sewage can only be profitably used on arable land for two or, at the most, three months out of the twelve. What is to be done with it during the remaining nine months? Clearly, it must find its way as quickly as possible to the nearest watercourse, purified or unpurified, as circumstances allow. The objects of a sewage farm are twofold. The primary, we think we may say, is to effect the purification of the sewage; the secondary, and scarcely less important, is to utilize such manurial constituents as the seasons permit. The two objects are not altogether incompatible; but it would seem clear that the ordinary arrangements of a sewage farm do not provide for both. Mr. Fowle, of Oxford, for instance, told the Conference at the Society of Arts, that the Corporation of his City were about to throw their sewage upon a farm close by the Thames, which would be as much polluted as before the drainage works were carried out. Other sewage farms in the kingdom are no better placed; and, perhaps, while agreeing with Mr. R. W. P. Birch, that certain farmers have profited by the application of sewage to land, we may take it as a fact that sewage farms have done but little for the purification of the liquid refuse of our towns.

The Bill of the Grand Junction Water Company has passed a Select Committee of the House of Commons, with the ugly insertion of auction clauses, at the instance of the Metropolitan Board of Works. The Company sought power to raise £300,000, with the usual borrowing powers, and it was, of course, intended that the new capital should be offered, as usual, to existing Shareholders. The Metropolitan Board officiously intervened, and the result is that the new capital must be offered to the public by auction. It is not to be expected that a large amount of capital not entitled to dividend will be raised under the operation of the auction clauses. The Company only pay 5 per cent., and are not likely to pay more for years to come, and since the investing public do not, as a rule, offer a higher price than will secure five per cent., we do not imagine that any considerable premiums will be realized. This infliction of auction clauses on Water Companies is somewhat novel. The Grand Junction Company are, of course, the first Metropolitan Company subjected to them; but all others will, in their turn, have to submit.

The Nottingham Water Company have also, as we have before mentioned, had auction clauses imposed upon them. This Company, in 1852, voluntarily proposed to offer their shares to the general public by auction; but they got tired of the system, and in 1874 succeeded in ridding themselves of the obligation. Now, however, as they come to Parliament after Mr. Raikes's Standing Order, they have the objectionable clauses forced upon them. The above, we believe, are the two first instances in which Water Companies have been compelled to offer their shares by public auction. In the one case, we do not think any considerable premiums will be realized, and it is difficult to see what benefit to the public can arise for many years to come. Long before the Grand Junction Company pay ten per cent., the Metropolitan Board of Works will have gone to the limbo of effete institutions. It was a precocious child; but, as is usually the case, the early promise of precocity never being fulfilled, the Metropolitan Board of Works will never acquire the Water Companies. They may pass into Municipal hands, but it will only be when the Board are a matter of history.

The Lambeth Water Company hold their half-yearly general meeting to-day, and we are happy to see that the profits admit of the payment of a six and a quarter per cent. dividend.

Contrary to our hopes, the Thirlmere scheme of the Manchester Corporation cannot be considered as safe in Parliament. The Bill was so much altered before the Select Committee of the House of Commons, that the Examiner of the House of Lords feels himself justified in reporting that, as it stands, the promoters of the Bill have not complied with Standing Orders. We do not, of course, know the feeling of Earl Redesdale on the matter, and all depends on the action he may take upon the question. If he approve of the measure, Standing Orders, though not strictly complied with, may be suspended; but without his approval the Bill must necessarily be relegated to another session, to the great discomfiture of all but the sentimental objectors.

Communicated Article.

WATER GAS.

In the JOURNAL of the 7th inst., we published a report made by Professor Würtz, on the chemical composition of the gas manufactured at the works of the Municipal Gaslight Company, New York. No doubt, many of our readers were surprised, on perusing that report, to find that the opinion entertained in past times as to the noxious character of carbonic oxide was entirely repudiated by the writer. We have thought, therefore, that a review of the history and progress of "water gas" manufacture might be interesting and useful, as bringing to light what the old school authorities really knew and said about the nature and effects of carbonic oxide. That it is present in large proportion in the mixed gases obtained by the decomposition of water with highly heated carbon in well-constructed furnaces is abundantly proved by the document just referred to, though its baneful influence seems therein to be completely ignored.

From the report of Professor Würtz, we find that on a certain day the gas under analysis contained 38·46 per cent. of carbonic oxide. Of course it did, the aim of the water gas maker being to produce this gas, instead of the incombustible article carbonic acid. The accomplishment of this object is that which inventor after inventor laboured unsuccessfully to achieve, until the time of the contrivance of the Kirkham furnace; in fact, Kirkham's method was considered a success because of this. No attempt, therefore, is made by the American users of his plan to disguise the presence of the once dreaded poison; knowing as they do that water gas cannot be profitably manufactured without admitting it as one of the constituents of the mixture.

Although it seems ridiculous to remove, by any means, however simple, so large a volume of combustible matter when once formed, yet it is well known that the feeling against it was so strong in France, some years ago, that the Alliance Company, holding the concession for lighting the "Hôtel des Invalides," being desirous to substitute the Kirkham gas for the coal gas they were then supplying professed that they would purify it in such a manner that it should contain only 2 per cent. of this noxious element. Arrangements were made for carrying this plan into effect, but the gas, on being analyzed, was found to contain from 30 to 40 per cent. of carbonic oxide, instead of the specified quantity. After reading the following report, we can understood why Kirkham's process was so unceremoniously abandoned in France at that time, and why in these days a Frenchman should take the idea to America, instead of trying it again at home.

"Extracts from the report of M. Pelouze to the Municipal Council of Paris, in the sittings of June 24 and 28, 1854:—

"*Kirkham's Gas.*

"The use of this gas should also be severely forbidden, and to prove it your reporter need only cite the passage from the process-verbal of your third sitting, in which is reproduced the opinion emitted before the Commission by M. Dumas:—

"'The oxide of carbon,' said M. Dumas, 'is a gas known from the commencement of the present century, and for many years no one thought of attributing poisonous properties to it—no man of science suspected it. When, therefore, 15 years since, it was proposed to me to employ water gas for lighting and heating, I must acknowledge I did not hesitate to advise, in my course of lectures, the making of experiments in this direction. M. Selligue appropriated to himself this idea, and made gas by the decomposition of water in the works at Batignolles, and rendered it luminiferous by means of oil of schist. Neither M. Selligue nor any one else then knew that this gas was poisonous. That was discovered later by M. Leblanc, in my laboratory, and we made some decisive experiments. It was proved that a mixture of 1 per cent. of oxide of carbon killed a strong dog in a minute and a half. It was a case of poisoning. With 1 per cent. of oxide of carbon all animals died at the end of a few minutes. These experiments terrified me. . . . Carbonic acid must not be confounded with oxide of carbon. . . . I formed an artificial atmosphere with 30 per cent. of carbonic acid. A large dog, on being placed in it, almost immediately fell on his side, but recovered himself on being restored to the pure air. 30 per cent. of carbonic acid did not kill, but, on the contrary, 1 per cent. of oxide of carbon is mortal. I am, therefore, satisfied that this oxide has the greatest inconveniences—above all, when applied to lighting.'

"M. Selligue believed, with the most entire good faith, in the excellence and in the harmlessness of his process. He lighted a part of the town of Strasburg. One night the gas penetrated into a baker's shop, and several persons died. This was the first proof of the poisonous properties of this gas. Some time afterwards, M. Dupuis Delcourt was desirous of making a balloon ascent, and, instead of taking hydrogen gas, he was obliged by accident to employ the gas of M. Selligue. The balloon was inflated; at the end of some seconds the aëronaut fell suffocated in his car. The balloon descended to the earth, and M. Dupuis Delcourt recovered his senses; but the persons who approached the balloon to give him assistance themselves fainted and fell. . . . It is impossible to admit that a gas producing such effects should be employed in any close apartment, in a shop, or in a theatre."

No process, however admirable and promising in other respects, could stand against such serious accusations as these, and, consequently, it was not long before Kirkham's system of gas manufacture was altogether abandoned in France. Its recent revival on the other side of the Atlantic leads us to notice what was done before Kirkham, and what has since been done by others; because there is no doubt that, if the water-gas idea becomes for a short time popular again, many transformations of the Kirkham furnace will make their appearance, and claim for themselves the charm of novelty.

We may note, in the first place, therefore, that before Kirkham's patent all the decomposers employed were fired on the outside, similar to gas-retorts; but since his time all are fired within—a distinction very broad and apparent, causing the difference in the amount of work done, for the fuel consumed, to be very great.

The idea of making hydrogen by the decomposition of steam was very prevalent in the early days of ballooning—the chemical method being a very cumbrous affair; but it was never brought into any

practical shape, the difficulty being the *fixing* of the oxygen. Could this have been readily accomplished, hydrogen from water would long since have been in the hands of the gas manufacturer for the production of light and heat, in preference to the mixed gases produced when water is decomposed by contact with incandescent carbon.

As far back as 1830 a patent was taken out by Michael Donovan for decomposing steam by passing it over red-hot coke or charcoal, and thereby evolving hydrogen and carbonic oxide, which, being inflammable, but non-luminous, had the latter defect corrected by the administration of some volatile hydrocarbon, which appears to have been a sort of naphthalizing at the burner—a system afterwards much improved by Mr. G. Lowe. In 1839 (May 8) Mr. Edward Oliver Manby took out a patent for "A New Method of Manufacturing Gas for general purposes of Illumination." The mode of action embodied in this patent was, no doubt, the type of all that followed up to Kirkham's time, save that he only claims the use of one decomposing vessel, and that of small diameter, through which steam is passed in contact with some sort of coal that is at the time being carbonized, whereas others claim to pass it through two or three, in order the more thoroughly to decompose the water vapour. But the distinctive feature of all—and hence the want of power to produce the required effect—is the application of the fire to the outside of the decomposers, "the same as for the distillation of gas from coals." The firing had to be most severe, and even then it was impossible to keep the carbon charge up to the temperature necessary for converting the steam into hydrogen and carbonic acid, and the latter into carbonic oxide.

This difficulty is unquestionably referred to in the first part of the specification of the patent taken out by Thadeus Sobienski C. Low, and George Spring Dwight, of the United States, and is mentioned by them in such a manner as to lead a reader to believe that they consider themselves to be the inventors of the remedy. They say: "Heretofore the manufacture of what is known as 'water gas,' for heating and illuminating purposes, has been practically unsuccessful, on account of the variable quality of the product, the excess of carbonic acid formed, the strain upon the apparatus involved by the heat required to obtain the best results, and the difficulty of producing the gases rapidly." We shall see, when we come to compare Kirkham and Lowe, with regard to dates and details, to whom is due the credit and value of the discovery, if any.

But to return to Manby. He, as we have before stated, claims having invented a "new method of manufacturing gas for illumination by passing steam into a retort or closed vessel containing anthracite, or stone coal, charcoal, coke, or bituminous coal, heated as hereinafter mentioned, and thereby obtaining a gas, or a combination of gases, applicable to the purpose of illumination." He used cylindrical retorts, about eight or ten inches in diameter, and placed them vertically in furnaces in twos or threes, according to circumstances. The furnaces, or combustion chambers, being supplied with fuel from the firing floor, were, therefore, always kept full. This, of course, subjected the retorts to a powerful and concentrated heat that soon destroyed them, although such heat was inadequate to the desired purpose, more especially as he only submitted the steam to one passage through each decomposer, instead of two or more.

Manby's patent was followed in the same year (June 22) by De Val Marino's, No. 8126, for "Improvements in the Manufacture of Gas," &c. The first part of the invention is described as "a method of decomposing tar, oils, and other fatty matters, and also water, whereby a more complete combination of the gases evolved is obtained, and, consequently, a more beneficial result than heretofore has been accomplished." The patentee then proceeds to describe a single group of his arrangement, by stating that *three* retorts are set vertically in a furnace, in such a manner as to become when fired intensely hot. All three are filled with coke or charcoal. *Two* of the group are used for effecting the decomposition of the water or steam, and the third for the vaporizing of the fat, oil, or tar. The steam having passed through the incandescent carbon of the first two retorts or decomposers, is presumed to be converted into a volume of hydrogen and carbonic oxide, equal to the yield due to the water vapour employed. This volume of mixed gas passes from the last of the decomposers to that into which the fatty matter, at the time being used, is slowly flowing, and takes down with it the hydrocarbon vapour, as it is generated in the third retort, through the heated mass of coke within, thereby forming carburetted hydrogen gas without the use of coal. Here we have the employment of three retorts in the circuit instead of one, and the application of matters rich in carbon, whereas Manby only seems to have aimed at increasing the volume of gas obtained from coal, without reference to its power. The following extract from his specification will make the Val Marino apparatus plain:—

"The drawing, fig. 1, represents in part section three vertical retorts suitably arranged for performing this invention, and the furnace is suitably constructed for conveniently heating and maintaining the same at a uniform temperature; *a*, *b*, and *c*, being the three retorts, one for decomposing the tar or oil, or other fatty matter employed, another for decomposing the water, and a third for continuing the process on the products of the water. It is not, however, material, which of the retorts are used for the separate duties, they being all similar. In the arrangement shown, *a*, is the retort in which the water is decomposed; *b*, the retort in which the tar or oil, or other fatty matter, is decomposed; and *c*, the retort into which the gases evolved in the retort *a* enter and are further decomposed, the object being fully to decompose the water before the products thereof come into the retort, *b*, to combine with the products of the other retort. *d* is a vessel containing tar or oil, or other fatty matter, and *e* is a vessel containing water. *f*, *f*, are two syphon-pipes which enter into upper parts of the retorts, *a* and *b*, and there are cocks on the vessels, *d* and *e*, to regulate the supply. The nature of the retorts, which are of cast iron, is clearly shown in the drawing, each retort having a projecting or

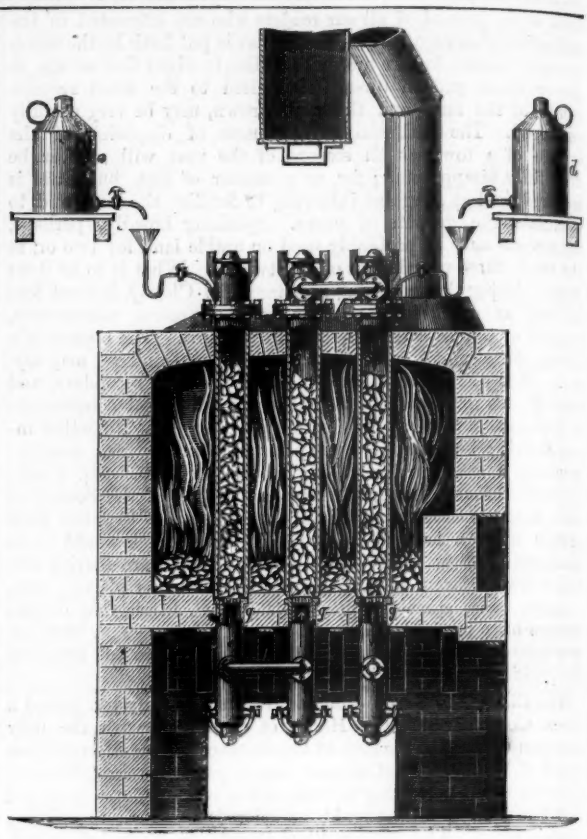

FIG. 1.

descending tube, *g*, connected at the lower end thereof, within which the gratings, which are similar to fire-bars, can be raised and lowered, and the coke or charcoal in the retorts rests on these gratings, which allow of the passage of any small ashes or dust of the coke. The arrows indicate the direction of the gases in and from the respective retorts, and the pipes, *h*, *i*, connect the retorts, *a* and *c*, and *b* and *c*, as is clearly shown in the drawing; and in using this apparatus the three retorts are filled from above with coke or charcoal, and then the ends of the retorts are to be closed, and all things arranged as shown in the drawing. I would here remark, that although I prefer that the retort, *c*, should contain charcoal or coke, this is not absolutely necessary, and it should be understood that I prefer the use of coke in consequence of its cheapness. The retorts are charged with fresh coke every 24 hours, and I have found that I am thereby enabled to retain the temperature required more readily. The retorts being at a good red white heat, the tar, or oil, or fatty matter, and also the water, is to be permitted to flow, observing that the water is allowed to drop in proportion to the requirement of the other matter employed, and as it is difficult to arrange apparatus to perform this operation in the nicety, and as the syphon-tubes might become more or less stopped in working, the simplest and best practical means I am acquainted with, for regulating the supply of water to the requirements of the matter employed, is to have a lighted gas-burner near the retort, and within sight of the workman. By this means he will, from time to time, be enabled to observe whether the result of his working is according to the desired object, and if he observes that the flame becomes more coloured than is proper, it will indicate that too little water is being supplied, and by this simple means the workman, having once set it right, the working will go on correctly unless some impediment is offered to the supply of the matter employed or the water. *j* is the gas-pipe leading to the gasometer. For it should be understood that carburetted hydrogen gas, thus manufactured, will not require purifying, which is an important advantage appertaining to this mode of working. It should be stated that the matter I generally employ, and according to the cost of the various matters above mentioned will, I believe, be most advantageous, is coal tar. And I would further observe that, although I prefer the arrangement of apparatus herein described for decomposing the matters and water employed, I do not confine myself thereto, provided the mode and process of working be retained as herein described."

We are rather surprised that such a man as Val Marino should have been led to believe that a gas made in the way he suggests would not require purifying. Coke contains sulphur, and when water is decomposed by being brought in contact with it whilst in a highly-heated state, some of the hydrogen formed combines with the sulphur present, and sulphuretted hydrogen is the result. From this there is no escape except by purification. Neither is it to be supposed that the decomposition was so perfect that no carbonic acid remained; if so, Val Marino did much more than has since been done even by Kirkham or Rowland.

(To be continued.)

QUALITY OF THE GAS SUPPLIED TO HULL.—Mr. Baynes reports that the gas sent into the district of Sculcoates and Myton, during April, by the British Gas Company, gave the following results, free ammonia and sulphuretted hydrogen being at no time present to the ordinary tests:—

	Max.	Min.	Mean.
Illuminating power standard sperm candles	16·21	15·10	15·76
Grains of sulphur per 100 cubic feet	28·60	26·50	27·80
Grains of ammonia per 100 cubic feet	—	—	·30

Mean barometer, 29·96; temperature, 57°.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

THE TEMPERATURE OF GAS IN ASCENSION-PIPES.

SIR,—Although indisposed to agree with my friend, Mr. Paterson, and with Mr. Newbigging, in their estimate of the practical importance of the question raised by the former, its solution is, at any rate, a matter of interest to all gas manufacturers. Taking this view of it, I have caused a series of observations to be made, placing thermometers in an ascension-pipe at distances of 1 foot 6 inches and 4 feet 6 inches above the mouthpiece. The retort, one of a setting of seven placed immediately over the furnace, and therefore the hottest, is a 21 inch by 15 inch oval, and was charged in the ordinary way with about 2¼ cwt. at each end at six o'clock and again at twelve o'clock. The following are the results, the observations having been taken every half hour:—

Time.	Above Mouthpiece, 1 Ft. 6 In.	Above Mouthpiece, 4 Ft. 6 In.
6.00 a.m.	248 deg. F.	154 deg. F.
6.30 „	260 „	168 „
7.00 „	270 „	164 „
7.30 „	274 „	150 „
8.00 „	280 „	140 „
8.30 „	290 „	135 „
9.00 „	284 „	128 „
9.30 „	282 „	125 „
10.00 „	280 „	120 „
10.30 „	278 „	115 „
11.00 „	280 „	115 „
11.30 „	280 „	115 „
12.00 „	280 „	115 „
12·30 p.m.	294 deg. F.	187 deg. F.
1.00 „	282 „	165 „
1.30 „	288 „	152 „
2.00 „	296 „	140 „
2.30 „	294 „	135 „
3.00 „	290 „	134 „
3.30 „	286 „	128 „
4.00 „	282 „	124 „
4.30 „	280 „	120 „
5.00 „	280 „	120 „
5.30 „	280 „	120 „
6.00 „	280 „	120 „

I venture to think Mr. Paterson has arrived at an erroneous conclusion, from the appearance of a higher temperature at the earlier part of the charge. This is surely due, not, as he supposes, to a higher temperature of evolution, but to the larger volume requiring to be cooled, the ascension-pipe being less efficient for this purpose at the beginning than at the end of the charge, when the volume given off is very much less. This is apparent from the above results, which show that the difference of temperature was greatest at the point farthest from the mouthpiece.

CHARLES HUNT.

Birmingham, May 24, 1878.

SIR,—In my last week's letter I gave a statement of the temperature of the gas, as indicated at the bridge-pipe over the retort-bench, before passing into the hydraulic main. Agreeably to promise, I now send you the notes of experiments made with a view to the further elucidation of the subject under consideration.

Experiment 1.

This experiment was conducted entirely under the usual conditions of working.

Clay retort, 20 feet through, one in a setting of seven.

Heat, bright cherry red.

Hole drilled in both ascension-pipes 3 feet above the mouthpiece.

Retort charged with 4 cwt. of cannel.

Temperature indicated on insertion of thermometer through the hole on one side of bench, 193° Fahr.

Temperature indicated on insertion of thermometer through the hole on the other side, 510° Fahr.

The temperatures indicated were clearly not those of the gas. In attaining the higher temperature especially, the mercury rose by starts at the rate of 3° to 5° at once, evidently caused by hot particles of solid carbon, or other solid or semi-fluid substances, coming suddenly in contact with the bulb of the thermometer.

The remarkable difference in the temperature of the two sides I account for in this way:—On the side in which 193° was indicated, the dip-pipe was probably sealed to a greater depth in the hydraulic main, and, consequently, the flow of gas was neither so abundant nor so rapid, on that side as on the other. This was evidenced by the thermometer, on withdrawal, being found less thickly coated with tar than in the other case. The gas was in a more quiescent state, and, therefore, there was not the same rush of hot solid particles against the bulb to raise the temperature abnormally.

Experiment 2.

The conditions were the same as in the previous instance; but, instead of inserting the thermometer directly through the hole in the ascension-pipe, a piece of india-rubber tube, 12 inches long, ¾-inch bore, was pressed against the orifice, and the gas allowed to flow in a stream through the tube. The object of employing the tube was to obviate, if possible, the contact of the semi-solid or semi-fluid substances previously referred to.

The result was:—Temperature indicated on one side, 250°; ditto on the other side, 324°.

The rise of the mercury was still somewhat irregular, and the instrument, as far as inserted, was again thickly coated with tar.

Experiment 3.

One end of the through retort was now bricked up, being made perfectly gas-tight, the gas passing away by one only of the ascension-pipes; in point of fact, the retort was made single instead of through.

In a short double-flanged piece of the ascension-pipe, within 8 inches of the top of the mouthpiece, were inserted six layers of iron wire netting, cut into discs, accurately fitting the bore of the pipe. Three of these discs had meshes one-eighth, and the other three three-sixteenths of an inch gauge, and the discs were kept three-fourths of an inch apart by sheet-iron rings, inserted edgeways into the pipe.

The charge, 2 cwt. of cannel, thrown into the retort, happened to be taken from a heap that had been exposed to the rain, and there was considerable moisture present.

The hole through which the thermometer was inserted, as in the previous experiments, was 3 feet above the mouthpiece.

The following were the temperatures indicated:—

Time. Minutes.	Temp. Fahr. Degrees.	Time. Minutes.	Temp. Fahr. Degrees.
10	200	55	177
15	198	60	174
20	195	65	172
25	192	90	160
30	190	105	158
35	188	120	150
40	184	130	150
45	182	140	148
50	179	150	142

Through all the higher temperatures, down to 172°, steam was condensed into drops upon a piece of paper held in the stream of gas issuing from the hole. Tar, though not entirely absent, was nearly so, the instrument on each withdrawal being but slightly coated. The temperature, with but few exceptions, rose with great regularity from that of the atmosphere of the retort-house (74°) to the rates observed, showing that the semi-solid particles, which were evidently the cause of the high temperatures previously indicated, had been nearly all arrested by the wire netting.

The higher temperatures, I am of opinion, were due to the presence of steam in the gas, in varying proportions, and this latter would be caused by the moisture in the coal.

Experiment 4.

The retort was again charged, this time with 2 cwt. of cannel in a drier state. All the other conditions were as in the previous trial.

The following were the results obtained:—

Time. Minutes.	Temp. Fahr. Degrees.	Time. Hours.	Temp. Fahr. Degrees.
2	158	1¾	129
7	174	2	123
12	177	2¼	122
17	172	2½	119
22	171	2¾	118
27	169	3	116
32	168	3¼	113
75	141	3½	110
90	134		

During the first half hour of the charge, the presence of steam, mixed with the issuing gas, was indicated as before, but less abundantly, though still, doubtless, affecting the results obtained. When the temperature of the gas within three feet of the mouthpiece was at 174°, it stood at 132° in the bridge-pipe, 14 feet higher up.

It may be suggested that the effect of passing the gas through the wire netting would be to lower the temperature of the gas, just as the wire gauze on a Davy lamp reduces the temperature of the flame impinging against it. The conditions in the two cases, however, are entirely different. The meshes were sufficiently large to admit of an easy passage for the gas, and the metal would be immediately covered with a thick coating of tar, virtually producing insulation. In addition to that, the temperature within 6 inches of the front of the bench was 208°, and the metal of the ascension-pipe, as well as the inserted wire netting, would, as a rule, be above the temperature of the gas.

I have not time at present to point the lesson which these various experiments convey; but there is little need to do so, as they speak for themselves, and they will be found, in the final results, to agree in a remarkable manner with the deductions of earlier investigators.

Cursorily it may be noted that there was but little accumulation of tar in the mouthpiece when the lid was removed after the trials with the wire gauze, the small quantity that was found being entirely converted into pitch; doubtless with an increase both in the quantity and quality of the gas produced.

THOS. NEWBIGGING.

5, *Norfolk Street, Manchester, May* 24, 1878.

SIR,—To the minds of those who are investigating the matter I ventured to introduce in my former letter, Mr. Newbigging's reply in the last JOURNAL will be a disappointment.

He assumes to have disproved the facts I mentioned, on the *supposition* that the high temperature I found in the ascension-pipe, near to the mouthpiece, was due to the heat transmitted by conduction to the pipe; and to have proved the truth of the received opinions, and consequently to have proved my experiments to be fallacious, by taking the temperature of the gas in three ascension-pipes, 14 feet from the mouthpiece.

Probably, in the midst of many duties, Mr. Newbigging had not time to carefully read my letter, for had he done so, he must have seen the folly of endeavouring to account for the high temperature at the mouthpiece in the way he has done. If, as is asserted, it is due to conduction, the question occurs, what raised the mercury in the ascension-pipe from 80°, at which it stood before the retort was charged with coal, to 640° immediately after, when gas was being evolved? or, what caused the temperature in the ascension-pipe, in the experiment recorded in the first column of the table accompanying my letter, to vary from 363° in the first minute after the retort was charged, to 544° in the eleventh minute, and then to fall to 172° at the end of an hour; or, to put it more familiarly, at the end of the charge? Would it not be impossible, with these facts in view, to come to the conclusion that the heat of the gas did *not* cause the mercury first to rise and then to fall again, as the temperature of the gas itself increased or diminished?

The experiments which Mr. Newbigging made at Manchester, although they are useful in their way, really do not come very near to the question, for it cannot be allowed that a thermometer 14 feet away from the source of heat can give any indication of the temperature at that point, and I am profoundly surprised that Mr. Newbigging should have considered them sufficiently condemnatory of my facts to justify him in the conclusions he has arrived at. His experiments neither prove the truth of received opinions nor the fallacy of my deductions; they are simply a record of the temperatures in three ascension-pipes, taken, under certain conditions, 14 feet away from the mouthpiece. The thought constantly recurs to my mind, as I write this, Why did Mr. Newbigging not put a thermometer in the ascension-pipe nearer to the mouthpiece—say, 3 feet above it—instead of the extraordinary distance of 14 feet away?

R. O. PATERSON.

Gas-Works, Cheltenham, May 24, 1878.

GAS-TESTING AT NEWCASTLE-ON-TYNE.

SIR,—Referring to the report of Mr. John Pattinson, inserted in the last number of the JOURNAL, I cannot but admire the good sense of the Newcastle Town Council and the Gas Company in agreeing to use the old-fashioned Liebig condenser, as a means of testing for sulphur, which gives results so satisfactory to both parties.

It would have saved a vast amount of trouble and expense had the London Referees adopted the same means of testing. The Gas Companies would then have had very little difficulty in dealing with the moderate quantity of lime required, and the official reports, on the principle that "ignorance is bliss," would have fully satisfied the public.

These reports are in their proper place in the local newspapers; but I think that, if it is necessary to publish a monthly report of the Newcastle testings in your widely-read JOURNAL, and thus give it the seal of the authority the JOURNAL deservedly enjoys, the system of testing should be stated, just as the burner is described.

If your readers were informed that these sulphur tests were made with an apparatus that was discarded, as unreliable, a quarter of a century ago, they would take the reports of 6, 5, and 4 grains at what they are worth, as did an Engineer who went to Newcastle in consequence of these low records, in order to become acquainted with the system of purification, which turned out to be no better than, if so good as, his own, although his average of sulphur is nearer 15 grains than 5.

Of course, those who know the circumstances place no faith in the reports; but probably the greater number of your readers are under the impression that the Referees standard test is used, the result being that unfair comparisons are made with those Companies whose gas is properly tested. Let us have all the reliable information that is to be obtained on this question; and if it be found in any place that the sulphur can *really* be kept down to an extremely low point without nuisance or difficulty, the whim of the public for a low proportion of sulphur will be cheerfully gratified by the adoption of the means indicated. GEORGE LIVESEY.

South Metropolitan Gaslight and Coke Company,
589, *Old Kent Road, S.E., May* 25, 1878.

[We have never thought it necessary to inform our readers that Wright's Sulphur Test is used by Mr. Pattinson at Newcastle. That gentleman asserts that the results obtained by the use of this apparatus are very nearly the same as with the Referees test. We believe this, however, to be contrary to the experience of all others who have used the two, and that the quantitative determinations made by the former are generally deemed quite untrustworthy.—ED. J. G. L.]

THE SALES OF GAS ACT, 1859 (22 & 23 VICT., CAP. 64).

SIR,—Some questions were asked in your last JOURNAL respecting this Act, to which I should like, with your permission, to give a short reply now, and one more at length on a future occasion.

The Act, although a public Act in every sense of the word, was not promoted by the Government of the day, but by some of the Meter-makers, adversely, rather than otherwise, to the Companies, but who nevertheless took no action in it one way or the other. I mention this as, it being one of the worst drawn, most unintelligible Acts that was ever passed, it is desirable that the Companies should not be charged with having made it so.

I will number the questions, and answer them separately:—

1. "Is it lawful for a Gas Company or Corporation, who have not adopted the Sales of Gas Act, to sell gas by meters which have not been stamped according to the Sales of Gas Act?"

Companies have nothing to do with the adoption of the Act. It is for the Local or District Authorities to adopt it, and for the Companies to regulate their proceedings accordingly.

If a city or borough adopts the Act, it applies only to their respective districts, and not beyond; but if a county adopts the Act, it applies to the whole of the county including those districts. It is quite possible, therefore, for part of a Company's district to be under the Act, and part not, and where it is not, the Company may proceed with their operations as though the Act had never passed.

A Company might apply the Act to the whole of its district if it thought fit to do so, but that would not give the Act any legal status; no one would be able to proceed against them for failure.

2. "Are all towns and boroughs in the United Kingdom compelled to adopt the Sales of Gas Act, or is it optional for them to do so?"

In England and Scotland, the Act of 1859 made it obligatory upon counties and county towns, where gas is used, to put the Act in operation, but left it optional only for cities and boroughs, other than county towns, to do so or not, as they saw fit.

In Ireland, the Act of 1859 made it compulsory upon all towns and boroughs to put the Act in operation, and they failing, upon the counties to do so for them, but so far only as the towns and boroughs could have done themselves.

The Sales of Gas Act Amendment Act, 1860 (23 & 24 Vict., cap. 146) provides (clause 1) that the Act shall not come into operation in any county of England, Scotland, or Ireland, until the authorities of such county shall have decided to bring such county under the operation of the Act.

The Act, therefore, so far as England and Scotland are concerned, can only be obligatory upon county towns, and there may be some doubt whether the sweeping provision of the Act of 1860 does not even override this, and leave the Act entirely optional.

3. "Can any Gas Company or Corporation, who have not adopted the Sales of Gas Act, clean and repair meters, and use them again, without having them tested and re-stamped according to the Sales of Gas Act?"

If the Local Authorities, county and town, have not adopted the Act, the Companies are not subject to it in any way, and may make, repair, sell, and use meters the same as though the Act had never passed.

4. "If any of my brother Managers can name any Acts of Parliament bearing on the above questions, they will greatly oblige."

The only two Acts bearing upon the question are the two Acts quoted in this letter. Reeson's "General Gas and Water Acts," published by Waterlow and Sons, contains these and all the other general Acts relating to gas and water, and every Manager should have a copy of it in his office. It is a small handy pocket volume, and the price, I believe, is 5s. W. LIVESEY.

Gas and Water Companies Association, 6, Victoria Street,
Westminster, May 25, 1878.

WASTE IN GAS-WORKS.

SIR,—My attention having been drawn to a paper by Mr. Hepworth, "On Waste in Gas-Works," a subject which should have our careful attention, I desire to record, for the use of others, what I am doing in one branch of that subject, that of the raising of steam. I have, for the past eight months, and am now raising steam in a boiler, 22 feet long and 7 feet in diameter, from the spent heat of one stack of retorts. At the present time there are only six fires out of the ten in this stack, which keep up the steam at 60 pounds pressure for one steam-jet exhauster, two small engines, and two "Special" pumps. Last year, this time, we used 31 cwt. of coke every 24 hours, besides the cost of extra fireman.

I fear there are few works that use so small a quantity of coke for fuel as 25 per cent., though I hope to bring mine down to that. Last year I was a little over 28 per cent. SAMUEL PETTY LEATHER.

Gas-Works, Burnley, May 25, 1878.

AIR AS FUEL.

SIR,—We have recently patented a complete combustion furnace, which entirely overcomes the difficulty experienced by "J. W." in the use of air. The principle consists in the production of a more or less impure carbonic oxide gas in the furnace proper, which is thoroughly consumed, in the chamber over the furnace, by fresh oxygen supplied through air channels and apertures in the sides. The furnace, which is of unusual depth, is wedge-shaped, being wider at bottom than at top, and the air is admitted above the line of fuel. There are two doors, the upper being for the purpose of supplying fuel, and the lower for cleaning. This furnace has now had a thorough and extended trial at the Aldershot Gas-works, with the most satisfactory results, as to fuel used, tear and wear, and labour in working. The whole of the furnaces at the above works are now adapted to work on this plan.

The furnace may be seen in operation at Aldershot, and we shall be glad to furnish any further information which may be desired.

Aldershot, May 23, 1878. WILSON AND DOUGLAS.

ANTI-DIP PIPES.

SIR,—Acting upon the advice of several of my friends and others professionally connected with the gas industry in various parts of the kingdom, I respectfully beg to draw your attention to the editorial observations in your last issue, in reference to an address by Mr. James M'Gilchrist (Dumbarton), delivered before the West of Scotland Association of Gas Managers. In giving your approval of the theory advanced, you appear to accord the credit—if any credit be due in connection with so important a matter—to the gentleman named; and I feel sure that you must have penned those lines in a moment of forgetfulness, inasmuch as the introduction of the theory to the gas world is not of so recent a date as the 25th of last month. During the past four years I have been labouring with a view to provide means for avoiding the evils produced by passing hot gas through the liquid in the hydraulic main, or, in other words, to prevent the rich illuminants of the gas being washed out of it by the action of the dip; and in a pamphlet which I wrote last year, I gave distinct reasons why the use of the dip should be at once dispensed with—identical, strange to say, with those mentioned by Mr. M'Gilchrist in his address. I may also remark that I have letters in my possession from several of the most eminent Gas Engineers in this country and abroad, extending to me their encouragement and compliments for having drawn the attention of the gas world to so important a matter, and for providing a remedy as well. The latter is now on the eve of being tried in London; it has been used with the desired success in several provincial gas-works during the past three years, and, with the latest improvements which I have effected, the success is now certain. Indeed, the question, through my own unaided exertions, has been brought to the front, and I am sure it will be very much to the benefit of gas companies and gas consumers in the end. A well-known Engineer and Author on gas matters, writes me as follows in reference to my system:—

"Your theory is entirely new, and more than that is correct, and calculated to upset all the old-fashioned ideas of the hydraulic main. You have undoubtedly a good affair in hand, and the importance of your system is now becoming recognized; in short, your valve is one of the most important of modern appliances in the manufacture of gas. You must be prepared for some rebuffs, as people will be slow to admit that they have been blundering for sixty years—making good gas, and then washing out its richest constituents in the hydraulic."

My only reason for not pursuing this part of the subject further, is my fear of wearying you, and I rely upon your usual courtesy and straightforwardness to correct what evidently was an unintentional passover of my just claim to be recognized as having been the first to draw the attention of Gas Engineers to the question—long before Mr. M'Gilchrist; and, what is more, I have provided a remedy which I cannot help thinking deserves to be noticed by the leading organ of the gas industry. By this post I beg to hand you a copy of my pamphlet descriptive of my invention and its application.

W. WHITE.

Abersychan Gas Company, near Pontypool, May 24, 1878.

[Our correspondent's automatic valve is described, and illustrated with three engravings, in our "Treatise," Vol I., page 257. In the paragraph in the JOURNAL to which he objects, it is not claimed for Mr. M'Gilchrist, and we are certain that that gentleman did not claim for himself, any credit as the inventor of the arrangement.—ED. J. G. L.]

INSTITUTION OF CIVIL ENGINEERS.—Mr. Bateman, as President, will give a *conversazione*, for gentlemen only, in the India Museum, South Kensington, on Monday, the 3rd of June, being the fiftieth Anniversary of the granting of the Royal Charter of Incorporation.

Parliamentary Intelligence.

HOUSE OF LORDS.

MONDAY, MAY 20.

The Examiners reported that the further Standing Orders applicable to the East Retford Borough Bill have been complied with; and that no further Standing Orders are applicable to the Maryport Improvement Bill.

Cockermouth and Workington Water Bill,—reported with amendments.

Lea Bridge District Gas Bill, Lewes Gas Bill, Nottingham Water Bill, Scarborough Water Bill,—read the third time, and passed.

Dalton-in-Furness Local Board Bill,—read the third time, with the amendments, and passed.

TUESDAY, MAY 21.

The Chairman of Committees informed the House that the opposition to the Bangor Local Board Bill was withdrawn.

Tredegar Water and Gas Bill,—reported without amendment.

Scarborough Corporation Water Bill—reported with amendments.

Weston-super-Mare Improvement Commissioners Bill,—brought from the Commons, read the first time, and referred to the Examiners.

Hamilton Burgh Bill, Hemel Hempsted District Gas Bill, Stoke-upon-Trent Corporation Gas Bill,—read a second time, and committed.

South Staffordshire Water Bill,—read the third time, and passed.

West Houghton Local Board Bill,—read the third time, with the amendment, and passed.

South Hants Water Bill,—read the third time, with the amendments, and passed.

Southport Water Bill, Limerick Corporation Gas Bill,—referred to a Select Committee, consisting of Earl Morley (Chairman), Earl Manvers, Lord Saltersford, Lord Gwydir, and Lord Hammond; to meet on Friday, May 24.

THURSDAY, MAY 23.

The Examiners reported that no further Standing Orders are applicable to the Newbury Borough Extension Bill; and that the further Standing Orders applicable to the Manchester Corporation Water Bill have not been complied with.

Hemel Hempsted District Gas Bill,—reported with amendments.

Maryport Improvement Bill,—read a second time, and committed.

Cockermouth and Workington Water Bill,—read the third time, with the amendments, and passed.

Radcliffe and Pilkington Gas Bill,—brought from the Commons, read the first time, and referred to the Examiners.

Manchester Corporation Water Bill.—The following petitions were presented in respect to this Bill:—Against it, from (1) Corporation of Wigan, (2) Millowners and riparian owners, A. B. Wood and others, (3) Owners of land proposed to be taken, Earl Bective and others, (4) Thirlmere Defence Association, (5) Ratepayers of Manchester, (6) Mary Countess Ossalinsky, (7) Rev. B. R. Lawson and others, (8) Reginald Dykes Marshall, (9) Charles Joseph Stonor, (10) Stanley Hughes Le Fleming; against alterations in it, from (1) Corporation of Oldham, (2) the Duke of Bridgewater's Trustees and the Earl of Ellesmere's Trustees, (3) Water Joint Committee of Leigh and Hindley Local Boards; in favour of and against alterations, from (1) Local Board of Atherton, (2) Local Board of Tyldesley with Shakerley; and in favour of amendment of it, from Members of the Committee of Visitors of the County Lunatic Asylum at Whittingham.

FRIDAY, MAY 24.

Nottingham Improvement (Gas, &c.) Bill,—reported with amendments.

Mansfield Commissioners Gas Bill,—read the third time, and passed.

Scarborough Corporation Water Bill,—read the third time, with the amendments, and passed.

Petitions in favour of the Southport Water Bill were presented from Inhabitants and owners of property in Maghull and Lydiale (two petitions), Down Holland, Formby, &c.

HOUSE OF COMMONS.

MONDAY, MAY 20.

Weston-super-Mare Improvement Commissioners Bill,—read the third time (verbal amendments made) and passed.

Burton-upon-Trent Commissioners Bill (Lords),—as amended, considered; an amendment made; to be read the third time.

Trowbridge Water Bill (Lords),—read a second time, and committed.

Metropolis Water-Works (Purchase) Bill,—adjourned debate on amendment on second reading further adjourned to Thursday, May 23.

TUESDAY, MAY 21.

The following resolution, reported from the Standing Orders Committee, was agreed to:—"That, in the case of the Leicester Corporation Bill (Lords), the Standing Orders ought to be dispensed with; that the parties be permitted to proceed with their Bill."

The Examiners reported that the Standing Orders not previously inquired into have been complied with in the case of the Lichfield Gas Bill.

Drumcondra, Clonliffe, and Glasnevin Township Bill, Grand Junction Water Bill,—reported.

Radcliffe and Pilkington Gas Bill,—read the third time, and passed.

WEDNESDAY, MAY 22.

Gas and Water Orders Confirmation Bill,—considered in Committee of the whole House, and reported.

THURSDAY, MAY 23.

The Examiners reported that the Standing Orders not previously inquired into have been complied with in the case of the Newry Gas Bill (Lords).

South Staffordshire Water Bill (Lords),—read the first time, and referred to the Examiners.

Local Government Provisional Orders (Droitwich, &c.) Bill,—considered in Committee of the whole House, and reported without amendment.

Gas and Water Orders Confirmation Bill,—as amended, considered; to be read the third time.

URBAN WATER SUPPLY.

On the motion of the Marquis of STAFFORD, a return was ordered showing the means by which drinkable water is supplied to every Urban Sanitary District in England and Wales, such means being provided by public or private arrangements. The return should state for each district—

1. The name and population according to the census of 1871;
2. The source from which water is supplied;
3. The arrangements made for the supply, by reservoir, wells (artesian or otherwise), rivers (if filtered or not), or any other arrangements;
4. Amount of daily supply, and whether or not the supply is sufficient;
5. Whether the supply is constant or not, and the quantity used daily;
6. The rateable value of the district;
7. The capital cost of the permanent works, if any;
8. The annual payment for principal and interest on money borrowed for the works;
9. The average annual cost of maintaining the works;
10. The annual amount of the water-rates and rents, if any;
11. The Act of Parliament or other authority under which the works have been executed;
12. What improvements, if any, are considered necessary.

METROPOLIS WATER-WORKS (PURCHASE) BILL.

Sir J. M'GAREL HOGG, in moving that the Order for the second reading of this Bill be read and discharged, said: I may perhaps be allowed to express my regret, considering the importance of the Bill, that the lateness of the session and the opposition which it has met, render it impossible to proceed with it with any chance of success. I should like it to be understood that it is not from any change of opinion on my part, or on the part of the Metropolitan Board of Works, as regards the Bill, that we take this step, for I have no doubt that when the purchase is concluded the cost will be much greater than it would have been if the Bill had been carried this session.

The Order for the second reading was then read and discharged, and the Bill withdrawn.

FRIDAY, MAY 24.

Bedlington Local Board Water Bill (Lords), Clitheroe Gas, Water, and Improvement Bill (Lords),—as amended, considered; to be read the third time.

Cheltenham Corporation Water Bill,—as amended, considered; amendments made; to be read the third time.

Bournemouth Gas and Water Bill,—reported.

Gas and Water Orders Confirmation Bill, Local Government Provisional Orders (Droitwich, &c.) Bill,—read the third time, and passed.

Sir CHARLES FORSTER gave notice that on Monday, May 27, he would moved that the Order (Jan. 30) that the Metropolis Water Supply Bill be committed, be read and discharged, and the Bill withdrawn.

HOUSE OF COMMONS COMMITTEE.

WEDNESDAY, MARCH 20.

(*Before Mr.* J. HOLMS, *Chairman; Mr.* W. G. CARTWRIGHT, *Mr.* BARNE, *and Mr.* BOWEN; *Mr.* BONHAM-CARTER, *Referee.*)

NOTTINGHAM WATER BILL.

NOTTINGHAM IMPROVEMENT, GAS, AND WATER BILL.

(*Continued from p.* 795.)

Mr. *Hawksley* recalled, and further cross-examined by Mr. STEPHENS.

In May, 1875, I made a report upon a joint water scheme which I had been called upon to investigate. It comprised various places, including Hucknall. I cannot say whether that scheme was seriously entertained by the Local Authorities, or whether any action was taken upon it. It embraced provision for the supply of 26,000 people. The present population is 32,000, and it is practically the same population, with the exception of Bulwell, which we have supplied. I do not know that these districts did combine and apply for a Provisional Order. I understood that they never did combine. I believe there was a local inquiry; they quarrelled among themselves, and the matter fell through. I do not know that, having applied to the Local Government Board for a Provisional Order, a local inquiry was held, and that certain landowners, the Duke of Portland's agent and others, opposed the scheme because there were certain springs and wells that could be made available. My impression is that Bulwell was recalcitrant, and in consequence the proposed combination broke up. In 1877 a communication was made from the Hucknall Local Board to our Company, but I think it was in the nature of a mere inquiry. At that time the water was not at the boundary of Hucknall as it is now; those pipes were laid the last in the district.

Re-examined by Mr. MICHAEL: There have been large sums of money expended out of the capital provided by the Act of 1874, for works executed before that time in respect of Bestwood. Speaking in round numbers, I should say about £9000. Then there was £2500 expended upon new workshops and stores, also on improvements at the Basford works. There were also additions and improvements upon various stations, reservoirs, and wells, and certain apparatus at the works, together costing £8500; and those three sums made up the £14,000 of which I spoke yesterday. That money has been paid since 1874. There was an amount of £6000 accruing due at that time on additions and improvements of which I have spoken. This, together with the £6000 expended over four years afterwards, make up the £14,000. With regard to the £28,000, which is the main sum, that has also been expended in necessary additions. That left us practically £60,000, out of which we have had to incur expenses, that were not contemplated at the time, in the supply of the district of Bulwell. Besides that we have had certain important debts expired, and we have paid those out of the borrowed money, to the extent of £12,600; and out of an income of £35,000 we pay £160 a year upon that account. It is a straightforward lawful process. In fact, the money was borrowed by the Company for a period of years, which period expired, and the course they took was to pay out of capital, and, as occasion offered, re-borrow the money. They might have advertised for the whole amount of the loan, or they might have converted it into capital, but that they did not do. The money we now ask for I consider absolutely necessary. The £60,000 will be required if we do not make any additional station, and we do not want an additional station, because we have a service of water which we intend to supply. The extension to Bulwell has cost £7200, and is not yet completed, because, as I mentioned, we furnish all the communication-pipes at our own expense. The whole of our capital has been expended in these extensions of our system up to the boundaries of these districts. We have expended £5000 in supplying Beeston, £3500 in supplying Arnold, £7200 in Bulwell, and the usual extensions which have been forced on us by the growth of the town, amounting to about £3000 in four years, making over £12,000. That brings the amount up to £27,500, which explains as nearly as I can at the present moment the sum of £28,134. There is an additional sum for iron pipes and main-laying. The whole of the capital is paid up, and we are left with a borrowing power of £39,000, which will be borrowed as occasion requires; but it has been my advice for 50 years that, if the Company are able to do so, they should work upon shares rather than upon mortgage.

Mr. MICHAEL: The fact has been mentioned almost as a charge against the Company that their shares are at a premium in the market. Can you explain why that is?

Witness: The shares are worth 30 years purchase, because they are secure. They are as good as money deposited in the funds. It is so because of the real property which is held, the number of securities, and the large sum which has been put into the concern not bearing interest. The Shareholders are secure of their 5 per cent. dividend. But then there are other similar undertakings. I am a Shareholder in the New River Company myself, and the shares are worth 40 years purchase. This is no doubt due to the skill and economy with which the undertaking is managed, and to the great development it has received. There is no reason why the future of the undertaking should be punished because it was well managed in the past.

Mr. MICHAEL: Taking the ratepayers point of view, can you supply water cheaper to Hucknall than it could be supplied by a separate undertaking?

Witness: I have nothing here in the nature of a comparative statement; but, of course, the larger undertaking would supply more cheaply than the small undertaking. They must have a staff, an engine, and a separate line of mains, while our line of mains will, or ought to, go through Hucknall. It must go through there in the ordinary nature of things, and a supply could be given to the inhabitants with the greatest facility by means of a reservoir which we intend to make upon the road leading from Linby to Bestwood. There is a point there 440 feet high, according to the Ordnance Survey level. It would be the same water as supplied elsewhere. There would be no advantage in the time of supply. The pipe for the district is upon this very boundary. There would be no advantage arising to them from the construction of works for themselves, which we could not give them.

By the CHAIRMAN: The Trent water would not be good for household purposes, but it would be good enough for manufactures. There is a good deal of dyeing and lace getting up, and several other trades, which would not be well carried on with the Trent water, as it contains sulphate of lime. Before we came to Parliament in 1874 our capabilities were exactly the same as now, when the Bestwood works came into operation, which they did some time in 1874, after we got our Act. The rates we charge public bodies for the supply of water are—for quantities so small as 1000 gallons in a quarter of a year 10d., and for quantities so large as two million gallons 6½d. per 1000; we begin to charge 6½d. at one million gallons. The charge to the Corporation for water supplied for sanitary purposes is, I believe, 4d. per 1000 gallons—*i.e.*, water for the street watering, sewer flushing, and so on. About one-third of the water supplied goes for trade purposes, and about two-thirds for domestic use. Last year the figures for the trade supply were 349 million gallons, and for domestic purposes 771 million gallons.

The CHAIRMAN: When you came to Parliament in 1874 for powers to borrow £100,000 you said it was likely to last for 16 or 20 years. Now you want £150,000. How long do you think that will last you?

Witness: That is a difficult question to answer. I can suggest to the Committee no reason whatever of advantage to the Local Board of Hucknall in having the supply in their own hands. They will only get into debt, whereas if they take our water this will not be the case. It would certainly cause greater expense and longer delay if they supplied themselves. Our supply is constant and large. The works are capable of supplying seven or eight million gallons a day, but the usual consumption is between three and four million gallons a day. We have also power to get water from the Trent, which we have not taken during several years. The Trent is so large that by increasing our works there we could draw ten million gallons or any other quantity we might require. There are about 200,000 people in the present and proposed districts. This population will increase probably at the rate of about 2 per cent. per annum. That is about the ordinary rate in industrial towns.

The CHAIRMAN: Have you not made a calculation as to what you are likely to do? You are asking for £150,000, and you had no parliamentary powers from 1854 to 1874—when you got £100,000, which you said would last you for 16 or 20 years. The Committee would like to know what your view is as to what you are likely to do with the £150,000 if you get power to acquire it. We should like to take down very minutely what you propose to spend. Let us begin with the works.

Witness: It will cost £60,000 to supply these new districts. We propose to supply them first from our superfluous means at Bestwood and elsewhere; therefore we shall not find it necessary to enter upon the new works you are fixing your mind upon for some years. You will find that when we begin the new works we shall want probably £50,000 or £60,000.

The CHAIRMAN: You say that the new districts will require an outlay of £60,000. What is that for?

Witness: Well, there will be a great ramification of pipes. I cannot exactly state the number of miles, and the cost per mile, but as far as I can recollect, the length, including distribution-pipes, will be 30 miles, which I think will cost about £20,000—£600 per mile. Besides that, there will be service-pipes and other things, which may be put down at £6000 or £7000. There are also the distribution reservoirs, for as the land is very undulating we shall require three of those, each of which will cost £3500. This will make another £10,000. The cost of new works and the purchase of land will be about £7500, putting the cost of land at £2500. These sums will amount to £36,000. and then we shall have to construct new works at Papplewick, which will cost about £70,000. Then we shall have to carry on the undertaking, which is always an expensive process when we have to supply new populations coming into the district. We shall not spend less than £2000 a year on an average. As to the manner in which the £70,000 will be spent, the works will consist of a large storeage reservoir, holding from two to three million gallons; two engines, each of 125-horse power; buildings for the engines, and all the appliances which we have at Bestwood. We have no reason to doubt that these will be precisely the same, and that the cost will be £70,000. The well will itself cost from £10,000 to £12,000. As to coming to Parliament for borrowing powers, my own view is that the promoters should not be compelled to come every now and then. I consider that they ought always to have plenty of money. We propose to borrow the sum we ask for at 4 per cent. We have capital in hand amounting altogether to £66,300. We have some real property which the buildings have nearly reached, but it is low-lying land on the margin of the Trent, and it will require to be raised, by deposits brought from the town, some six feet higher than it is at present. The population of Eastwood parish itself is about 3500, but including Kimberley, Watnall, Moor Green, Brinsley, and Newthorpe, the population will be over 9000. The place is most distressed for want of water. The people have applied to us, both by memorial and deputation, to supply them, in consequence, no doubt, of the failure of the project which has been spoken of, and of which I was Engineer. Greasley and other places have asked us to supply them. The mining population is increasing in the neighbourhood. The Great Northern Railway have just completed a new line to supply the increasing requirements in this respect, and the Midland Railway have also constructed a new line. There has been a large increase to the population of Hucknall recently—some 3000 people have settled there, chiefly owing to a new pit having been sunk by Mr. Montague at Linby. Although the pit is at Linby, the people engaged at it reside at Hucknall. Mr. Montague is now letting out land for the erection of buildings.

By the COMMITTEE: I consider there is such a prospect of remuneration in the district proposed to be supplied, as would remove all possible unfairness. Hucknall lies in the direct route of the mains, and if we did not get parliamentary powers to go through Hucknall we should have to go round it. That would entail both some additional expense and some additional inconvenience. It is perfectly practicable to go through Hucknall. I attach importance to having the power to go through Hucknall. We have agreed to pay Mr. Montague £100 a year for the privilege of going through that district, which is out of the Papplewick district, but where we must go to get our water. We pay £200 a year for the privilege of taking water in the Papplewick district. As an Engineer, I attach importance, in the execution of any scheme, to going through Hucknall. We contemplate laying down 30 miles of pipes, but of these 30 miles, only 4 or 5 miles would go through Hucknall—1¼ to 1¾ miles. That would be main-piping leading to Greasley, Eastwood, and other places beyond. That would give us the facility of having the water from Papplewick in the shortest and most direct line to these places. If we did not go through Hucknall we could reach these places by going round, but it would involve additional expense for piping, the amount of which I have not calculated. I think it would be about £2000. The ground is very undulating, but that fact would not add to the expense in this respect, though it would have some effect on the service reservoir. In the event of not going through Hucknall, the ground we should have to take would be undulating, but I think not more undulating than in the other case. I think in that respect the two lines are about equal, but one line would be longer than the other, and would not possibly in all cases be along public roads.

Mr. MICHAEL said every one of the places mentioned, including Hucknall, had memorialized the Company to give them a supply, and another place called Carlton had also petitioned the House, and had presented a memorial to be included in the scheme of the Company. He had a host of witnesses who could be called, but he proposed to hand over these memorials.

The CHAIRMAN: Of what nature is the evidence of these witnesses?

Mr. MICHAEL said he did not propose to call them. He had witnesses of every description—geological, chemical, mechanical, and others—but he proposed to call the Medical Officer of the district, in order to show that, as the memorial stated, the supply of water was necessary.

Mr. STEPHENS said, if it would save his learned friend any trouble, he might admit that, with regard to Hucknall, this matter of the necessity of improving the water supply was common ground between them.

Mr. *Stephen Moore*, Accountant of the Company, was called to speak to their financial position. He said the statement of capital put in was correct.

Dr. *Whitgreave*, examined by Mr. MICHAEL.

I am the Medical Officer of Health for the Basford Rural Sanitary Authority, but not for Hucknall. The condition of the district which I represent is exceedingly bad in respect of water supply. The water is very scarce indeed, and the supply is very impure as a rule. I think the supply proposed by the present Bill of the Water Company will be a great boon to the district, and, speaking as the Medical Officer, I think it necessary that the water supply should be more efficent. Memorials have been presented from all the places within the district I represent. I appear as the Officer of Health for Carlton, where there is a very scarce supply, and where the people are even worse off than they are in some parts of the place at Eastwood. I consider it to be of the utmost importance that a supply should be provided for Carlton. In other parts of the district there is a general feeling that this supply is unnecessary. In Awsworth they have no water whatever, except what runs off the slates; with this exception they have not a gallon from year's end to year's end. In Eastwood the supply comes from a brook about a quarter of a mile from the village, and this has been analyzed and proved to be simply sewage. In Kimberley they have a few supplies in the precincts of certain breweries. These are all of excellent quality, but in the rest of the village the water is very impure. In the two Brinsleys, typhoid is very common from the impurity of the water, and even this water is difficult to obtain. I have never been in any part of England where the people were so badly off for water as they are in these districts. In Greasley, between Eastwood and Kimberley, they are very badly off, and typhoid has occurred, which was entirely due to this. I am sure there is no other source of water supply available which would be so efficient as that proposed by the Company.

Dr. *C. Meymott Tidy*, examined by Mr. MICHAEL.

I am Professor of Medical Jurisprudence, and Lecturer on Chemistry at the London Hospital. I have given very great attention to questions of water supply. I have visited this district, and have looked into the sources of supply. The result of my inspection was that the water was very small in quantity. I took two samples for analysis, which, I think, represent fairly the supply of Linby on the one hand, and the supply of Eastwood on the other. I took the sample at Linby from a well near the blacksmith's shop, and found that it contained a considerable proportion of common salt. I have no doubt that it was loaded with the products of sewage water. Such water would be totally unfit to drink, and would be liable to produce typhoid. The Eastwood people generally were taking their water from the Nether Green Brook, from which I took a sample, and found it was simply sewage. The water supplied by the Nottingham Company would be a great boon; it is beautiful water. I took three samples of this water—one from the old works, one from Basford, and one from Bestwood—and I found them all excellent. I think the supply to the district I have named is urgently called for. I visited Hucknall, but did not take samples of water from there. I saw that it was in want of a better supply as to quantity. In choosing a well from which to take a sample, I always took one which I thought would be fairly representative.

Mr. MICHAEL intimated that he had many other scientific witnesses to call, but

The CHAIRMAN said the Committee did not consider further evidence on this point necessary.

Mr. MICHAEL: I have excluded Hucknall in this matter; but in respect of the other places I think I have satisfied you that a supply to them is necessary and desirable.

The CHAIRMAN: Quite so.

Mr. *Charles James Neale*, examined by Mr. MICHAEL.

I am a Land Surveyor, and am such on the Duke of Portland's estate. His Grace owns considerable property in Hucknall—2227 acres of land and 109 houses. There are 3109 acres in Hucknall, and more than two-thirds belong to the Duke. There are also 86 houses erected by a Colliery Company on land let to them on lease. There has been a recent survey of the parish, and by a reference to the rate-books I find there are 1900 houses. The rateable value of the parish is £24,417, of which £7964 is for mines, railways, &c., leaving about £16,000; and out of that the rateable value of the Duke's property is £3148 12s. The population at the present time is estimated at 8300, giving 4·37 persons to each house. The rate-book shows that 352 persons pay their own rates—that is to say, that the rest of the rates are compounded for; 1548 houses are compounded for. They belong to 243 owners, and the rates are paid by the owners. A memorial was presented to the Company calling upon them to supply water.

Mr. *Grainger*, by whom the memorial was presented to the Company, was called to prove the facts.

Mr. *Neale*, recalled, was examined at some length as to the local feeling in favour of the Company's Bill, and stated that he was instructed by the Duke of Portland's Solicitor to give evidence in its support.

Mr. *Bayley*, the Solicitor just named, said, in examination by Mr. MICHAEL, that the Duke was of opinion that the Nottingham Water Company's scheme was the most desirable. He objected to that of the Hucknall Local Board.

By Mr. STEPHENS: His Grace objects to the Hucknall scheme on the

ground of expense, and he is also of opinion that it would not give as efficient and early supply as the other scheme. A clause has been prepared for insertion in the present Bill, by which the Company undertake, within three months of the passing of the measure, to supply Hucknall with water.

Mr. *Cundy*, Land Agent and Surveyor, acting on behalf of Mr. Montague, also gave evidence in support of the Company's Bill, as did Mr. *Fisher*, Solicitor to Mr. Montague. He said Mr. Montague objected to the Hucknall scheme, because they proposed to sink a well right in the middle of his property to take water, and they did not want to pay for it. He was not anxious to sell the water at all; but he had been pressed on all hands to do so, and he had consented for public reasons. If the Water Company did not obtain parliamentary powers within five years the agreement lapsed.

THURSDAY, MARCH 21.

Mr. *S. Moore* recalled, and cross-examined by Mr. VENABLES.

The present share capital of the Company is £350,000. The £50 shares are now sold at £75. The amount required to pay the statutory dividend is £17,500. At 30 years purchase that would be worth £525,000. If we were allowed 6 per cent., and the purchase was taken at 25 years, it would amount to the same thing.

Mr. VENABLES: I do not know whether it is within your knowledge that before the Bill came before the Committee an offer was made by the Corporation to the Company, to give annuities of 6 per cent. for the purchase of the undertaking?

Witness: I do not know it officially. I have heard that such was the case. The offer was not accepted. I believe the same offer was made in 1874.

Mr. VENABLES: I merely wish to call the attention of the Committee to the offer of the Corporation—either 30 years purchase of the present dividend, or annuities of 6 per cent.

Mr. POPE (to witness): You say the shares in the market are fetching £75—that is, where the seller is willing to sell, and the purchaser wants to buy. If the purchaser wanted to buy and the seller did not want to sell, that would, of course, increase the value. What would be the market price of a share not in the market? Because that is our position—we are not sellers, and we want our price fixed?

Witness: I cannot say.

Supposing you have an unwilling vendor, do you think that the market price has anything to do with what ought to be paid?—I cannot say.

Mr. *Frederick Francis Fox*, examined by Mr. POPE.

I live at Melbourne, Derbyshire, and am agent for Earl Cowper, who has large estates at Greasley. Of the supply suggested by the Nottingham Water Company I approve entirely. I think it is the best that could be obtained for the district, and one which, in my judgment, should be recommended to Parliament. There is not a sufficient supply to our district now, but this scheme of the Company would provide it. I know Hucknall, and other places included in this scheme, and they are very badly off indeed for water. In fact, I do not know a district where the supply is so deficient, and what is now obtained is impure. I believe that if a proper and healthy supply of water could be obtained building operations would largely extend. I have heard the evidence given as to the quality of the Nottingham water; I do not know anything of it personally. I cannot say that I look with any satisfaction at the suggestion of the Corporation to take over the water-works. I think the Corporation would not have the same interest in supplying those districts that the Company would have. Local interests would predominate in the Corporation. It might be to the advantage of the borough for the Corporation to take the works, but for the outlying districts I certainly think the supply is better in the hands of the Company. I look with satisfaction upon the proposal of the Company to extend their operations.

Mr. STEPHENS: Did I understand you to say something about extending the business of the Water Company? You think it is undesirable that the Company should be allowed to extend their works, and that it would be much better to allow the Local Board of Hucknall to supply the locality with water?

Witness: I said nothing of the kind. Some external districts, not within the suggested limits, are very anxious to be included within the Company's area of supply.

The CHAIRMAN: We should like to have some evidence with regard to a statement made by Sir Edmund Beckett in his opening speech, in which he says that the cost of supplying Hucknall would be £970.

Mr. POPE: That it would not exceed £970—that is the meaning of it.

Mr. *J. Richardson*, Agent to Lord Mexborough, the owner of large estates in the neighbourhood of Brinsley, deposed to the want of water on the property, and to the desire of his lordship that it might be supplied by the Nottingham Company.

Mr. *F. Brewster*, examined by Mr. POPE.

I reside at Nottingham, and am the owner of building and other land at Hucknall. I have interested myself very much in the question of water supply to the place, and I have ascertained what would be the extreme cost of supplying Hucknall with water, supposing that the Nottingham Company supplied it. The cost would be, as near as I can estimate it, £800. I arrived at that figure by taking the gross estimated rental from the poor-rate of Hucknall—viz., £28,010. I have subtracted from that the lands and farm houses assessed under Schedule B of the Property Act. They amount to £6530. Then there is the Midland Railway, £748; the Hucknall Colliery, £8470; and the rights of shooting, mills, collieries, local board office, public hall, and a few little items for places not being dwelling-houses, which will, altogether, amount to £470. That makes a total deduction of £15,223, leaving a balance of £12,787, but I should mention that the rate I have taken this from is, perhaps, twelve months old, and that there may have been a lot more houses built since, which may add some £800 or £900. I have assumed that there are 1865 houses, with an average of between £7 or £8 a house. The scale of charges of the Nottingham Company to houses of that value is seven shillings within the limits of the borough. They take power in their Bill to charge 25 per cent. more than they do now. I may say that Mr. Stevenson, the Engineer to the Local Board of Hucknall, has said that the price which would be charged if the scheme of his clients was carried out would be 13s. per house. He said that at the Local Government Board inquiry.

Cross-examined by Mr. STEPHENS: I own 13 cottages in the district. I am joint holder of 5½ acres of building land, of which I have sold a quarter, but I do not know which quarter. I am half freeholder of a siding at one of the collieries, and I have an interest as a mortgagee in several other matters. Mine is a small interest in Hucknall as compared with the Duke of Portland, but as compared with the Local Board it is very large. I am desirous there should be a good water supply to the district. I have no practical knowledge or connection with questions of water supply, except so far as my own knowledge extends. I have lived in many towns in England, on the Continent of Europe, and even in Africa, but I never saw so good a supply as the Nottingham Water Company give. I have an interest in the Company to the extent of about £200.

(To be continued.)

Miscellaneous News.

METROPOLIS WATER SUPPLY.

THE ABORTIVE SCHEMES OF THE METROPOLITAN BOARD.

The *Builder* says: "The Metropolitan Board of Works have stayed proceedings on both of their Water Bills—viz., that for the double supply of water, which was to render unnecessary the purchase of the existing undertakings, and that to authorize the purchase of the existing undertakings. We ventured to predict, some time ago, that this would be the case. But what we are not able even now to predict is, that the Board will take warning by the general opposition that the proceeding has awakened, and by the keen and destructive criticism which has been applied to these projects, and promise not to undertake any colossal measures in future without some kind of preliminary assurance that they will meet general support or public approval. Nor is the cost to the ratepayers all that has been caused by the abortive and ill-considered schemes as to which Mr. Runtz promises that 'the Board would not let the question drop.' Mr. Roche's memorable boast, 'that the Board were not afraid of expense,' seems fairly to express the sentiments of that body. We question how far the ratepayers and vestrymen will be pleased with the annual addition of even so small a sum as £12,000 to the salaries and expenditure of the professional officers of the Board, paid them for taking Bills into Parliament so drawn that their movers have not even ventured to ask for a second reading. But this sum represents only a portion of the money-cost inflicted on London, to say nothing of harass and loss of time. Every one interested in the matter appears to have done something to oppose the Bills. The Bills themselves were propounded in the teeth of the reports of the two Committees of the House of Commons—that of 1867 and that of 1869. No single good word, as far as we are aware, has been uttered in their behalf by any individual whatever, who was neither a member nor an official of the Board of Works. But our protest is on behalf of the ratepayers. It is bad enough to ask them for £12,000 to pay for the blunders of this year. But the Board, as far as their opinions are represented by Mr. Runtz and Mr. Roche, will not be contented with this. They 'will not let the matter drop.' It is, unfortunately, but too likely that as long as large parliamentary bills are annually paid, out of the pockets of the ratepayers, by a Board 'that does not fear expense,' the question will be kept alive. Surely it is a ratepayers question; and we should be glad to hear what the ratepayers have to say about it. If they are content to pay nearly double water-rates for the privilege of putting the control of the water-works in the hands of the Metropolitan Board of Works, it is not worth while to say anything more as to such a bagatelle as an annual expenditure of £12,000 for the luxury of depositing Bills for that purpose."

The *Engineer* says: "At the meeting of the Board, on the 10th inst., it was resolved to take steps to stay further proceedings on the Bills introduced by the Board for acquiring the water supply of London. Probably it is seen that, with a few modifications in the existing method of levying rates, and in the amount of those rates, and with the completion of the constant supply, the public will be better served by the present Companies than it would with the works in other hands, supplemented by a new scheme necessitating large outlay for a makeshift supply, and an unending expenditure for street repairs."

Major Lyon, a late member of the Metropolitan Board, writing in the *Daily News* on the lavish expenditure and reckless financing of that body, says: "I should occupy too much of your valuable space if I was to give a detailed list of the numerous Bills which the Board have introduced into Parliament only to be withdrawn. But to take the last performance of the Board in this direction, I will name the London Water Supply Bill. This Bill, promoted, we are told, at the cost of many thousand pounds, has, as usual, been withdrawn, it being too absurd to be entertained by any reasonable being. Thus we see again our money disgracefully squandered, and be it remembered that this Bill was not promoted by a large section of the Metropolitan Board of Works, but by the single vote, and then by the casting vote, of the Chairman. The division list showed 13 for promoting the ridiculous Bill, and 14 against; whereupon the Chairman gave his vote, and then his casting vote! Surely it is time to leave no stone unturned, either in Parliament or otherwise, to put a stop to such reckless waste of the ratepayers money."

Major Bolton reports that the state of the water in the Thames and Lea was very turbid and much discoloured during nearly the whole of the month of April. In the Thames at Hampton, Molesey, and Sunbury, (where the intakes of the West Midlesex, Grand Junction, Southwark and Vauxhall, Lambeth, Chelsea, and East London Companies are situated) the water was bad on the 1st, when it became coloured, and increased in turbidity until the 9th; it then changed for the better, and improved in clearness on the 11th, from which date it again became bad, and remained in that condition for the rest of the month. The highest flood state of the river at Hampton during the month was 1 foot 10 inches above the summer level, and the lowest 3 inches below the summer level. The Thames was in a state of flood for nearly one-half of the month. The alterations in the works of the Southwark and Vauxhall Company at Battersea have put them into a more satisfactory condition, and the reconstruction of the filters is now finished. Several important alterations have recently been made to the Hampton engines of the West Middlesex Company, by which their power has been increased. A new river wall has been erected at Hampton, and a new boiler-house and two new boilers are in course of construction for Hammersmith. The slight turbidity of this Company's water referred to in Dr. Frankland's report for March last, has been traced to a fault in the immediate vicinity of the stand-post in the cab rank at Portland Road, from whence the sample was taken. The fault has been removed, and, having been purely local, the general excellent quality of the West Middlesex Company's water as supplied throughout their district was not affected thereby. It is highly satisfactory to announce that the proposed construction by the Grand Junction Company of further impounding reservoirs for subsidence at the intake at Hampton (so as to avoid the flood waters), has been decided upon by their Court of Directors, and the works will at once be commenced. These new reservoirs, when finished, will enable the Company to deliver effectually filtered water during the period when floods prevail. The filter-beds at Kew will also be put in thorough working condition, and the area thereof extended. These much needed additions and alterations will, without doubt, greatly improve the quality of this Company's supply. The Lambeth Company have given notice to commence a constant supply in a district bordered by the Kennington Park Road to the Elephant and Castle, the Walworth Road, and across Grosvenor Park, and other streets, to the point of commencement at the Company's old offices, and are also giving constant supply in a number of courts and alleys. The alterations in fittings under the Board of Trade rules and regulations are being gradually effected as occasion offers, and are carried out in all new buildings. The Directors of this Company intend proceeding with the construction of additional filters at an early date; this work is much required. The new works of the Chelsea Company at Molesey are working very satisfactorily.

BOMBAY GAS COMPANY, LIMITED.

The Half-Yearly Meeting of this Company was held on Thursday last, at the London Offices, Great Winchester Street—D. T. Evans, Esq., Chairman of the Company, presiding.

The following report and statement of accounts were presented:—

Your Directors have pleasure in submitting to the Shareholders a statement of accounts, duly audited, for the half year ending Dec. 31 last.

The condition of the Company is satisfactory.

The gas and meter rental shows an increase of £1135 16s. 10d. as compared with the same period last year; whilst the cost of working shows a slight decrease, and this, notwithstanding the fact that, in the period under review, a larger quantity of gas was manufactured and distributed. There has been a steady advance in the use of gas by private consumers, and this assuring feature continues.

The amount standing to the credit of profit and loss account for the half year is £10,407 5s. 11d., which, with the balance of £614 8s. 9d. brought forward, makes £11,021 14s. 8d., and after appropriating £250 to the reserve-fund, and writing off from the same £273 9s. 9d., and providing for interest on debentures, the balance of general revenue account is £10,425 4s. 8d. Out of this your Directors recommend the Shareholders to declare a dividend of 4 per cent. for the half year, free of income-tax, making 7¼ per cent. for the year. This will absorb £9690, and leave a balance of £825 4s. 8d. to be carried to the credit of next half year.

The Director retiring by rotation is Henry Palfrey Stephenson, who, being eligible, offers himself for re-election.

The Auditors, Edward George Bradley and Robert King, retire from office, and, being eligible, offer themselves for re-election.

The dividend will be payable on and after the 1st of June next.

General Balance, Dec. 31, 1877.

Dr.				Cr.		
Capital authorized—(50,000 shares, at £5 each—£250,000.)				Construction account		£203,487 16 11
40,000 shares, £5 paid		£200,000 0 0		Less written off preliminary expenses		200 0 0
10,000 „ £4 paid		40,000 0 0				£203,287 16 11
Debentures		6,550 0 0		Retort account		1,103 8 6
Amount owing by the Company		6,565 0 9		Services account		73 8 1
Reserve-fund	£8,546 12 0			Goods *in transitu*		113 19 5
Added this half year	250 0 0			Stocks, viz.—		
	£8,796 12 0			Chandeliers, brackets, &c.		5,082 15 11
Written off for depreciation & from preliminary expenses	273 9 9			Brass and iron goods, &c.		5,318 7 0
		8,523 2 3		Mains, services, and tools		1,806 8 4
Insurance-fund		1,687 1 7		Meters		2,581 0 4
Passage-fund		383 17 11		Coal		22,190 7 9
Balance to general revenue account		10,425 4 8		Residual products		2,160 18 6
				Amount owing to the Company		4,587 1 1
				Cash at bankers, on deposit, and in hand, viz.—		
				In Bombay		24,215 17 3
				In London		1,612 17 11
		£274,134 7 2				£274,134 7 2

Profit and Loss Account.

Coal carbonized	£7,797 17 2	Gas and meter rental		£19,749 16 5
Wages	1,220 4 11	Coke, tar, fittings, &c.		3,850 0 8
Purifying	12 0 0	Interest		279 16 10
Maintenance of retorts	220 13 8			
Trade and general charges	861 18 0			
Salaries and Collectors commission	1,595 2 4			
Rents, rates, and taxes	313 6 10			
Directors and Auditors remuneration	626 5 0			
Bad debts	8 14 0			
Law charges	2 5 7			
Exchange account	814 0 6			
Balance	10,407 5 11			
	£23,879 13 11			£23,879 13 11

General Revenue Account.

Interest on debentures	£346 10 0	Balance, June 30, 1877	£9,014 8 9
Amount carried to reserve-fund	250 0 0	Less dividend paid Jan. 1, 1878	8,400 0 0
Balance carried down	10,425 4 8		£614 8 9
		Balance for half year ending Dec. 31, 1877	10,407 5 11
	£11,021 14 8		£11,021 14 8
		Balance for appropriation	£10,425 4 8

The Chairman: Gentlemen, it has been my custom at these meetings to amplify the report by some remarks that may be of service and interest to you. In the first place, I may be permitted to congratulate you upon the existing state of the Company. It is, I may say, flourishing; at all event, if its progress has not been rapid, it has been sound and satisfactory. Two adverse circumstances have materially affected our prosperity during the six months now under review. The first of these is the low price of coke; and this has been due to various causes, chiefly to a decreased demand, owing to the stagnation of trade; to the stop that has been put to building operations by the condition of trade in Bombay; and, last of all, to the competition of coal, which has been at a very low price, so as materially to affect the sale of coke. Our sale of coke is dependent, to some extent, upon building operations in Bombay. The lime-burners have been very large consumers; but for nearly two years that trade has fallen off to a considerable extent. Our Manager in Bombay has himself visited the kilns, and has found that one-fourth only were burning. This has, of course, operated materially against us, as regards making profit out of our coke; but I shall touch upon that subject again. The second adverse circumstance that has affected us is the loss upon exchange, and that has been very serious. On £31,000 brought over during the year the loss on exchange has been £2814. On the whole, we have got our money over under not very bad circumstances; we have brought it over during the six months at the rate of 1s. 10d. a rupee; but, nevertheless, we have suffered the loss stated. It has been unavoidable, and has been due to many causes. The chief of these, I believe, is the low price of silver, and the fact that the balance of trade has been unquestionably against India. A paragraph appeared in *The Times* of Monday last, which is very significant; it is to this effect: "The report of the trade of British India for the financial year 1877-8 shows a gross import duty of 44,771,925 rupees, against 41,790,470 rupees last year, and a gross export duty of 5,647,439 rupees, against 6,500,793 rupees last year." So that it is very manifest the trade of India has greatly fallen off; and if the Indian trade has been embarrassed and diminished, it cannot do otherwise than affect us. I think that the price of silver has been very materially kept low by the fact that Germany has poured into this country many millions more than were expected. The fact of her changing her currency from silver to gold has brought this about. Turning to our actual working, the result, in the face of all these disadvantages, has been most satisfactory. Gas and meter rental shows an increase of £1135. In the corresponding half of 1876 it was £18,614; in the last half of 1877 it was £19,417, and I am happy to say that the increase still continues. Our private lighting is steadily advancing, and the cost of working shows a slight decrease. Coal being the raw material out of which we make our profits, all that relates to it must be of interest to you. Our stock of coal on the 31st of December was 12,585 tons, and since then shipments from Australia have been made amounting to 6500 tons. These shipments have arrived in safety, and are now in the works, so that whatever troubles may be in store from war or any other causes, we have, at all events, 18 months supply on hand. With regard to coke, our loss has been very serious indeed. On the 31st of December, 1876, it realized £2 4s. 10d. per ton, but in the last half year it only brought us £1 8s. 2d., showing an adverse difference of 16s. 8d. per ton. The returns for the whole year from coke amount to £6605 18s. 9d. I now come to the next item of residual products—namely, tar. That has made a very steady advance from the first, and it continues. Its use was scarcely known in Bombay, but, as its utility becomes known, its value increases, and we are now reaping the benefit of it. The returns for the year amount to £1720 13s. 6d. The quantity of gas made was 81,543,000 cubic feet, against 75,892,000 cubic feet in the year 1876, showing an increase of 5,651,000 cubic feet. The gas sold in 1877 was 74,157,800 cubic feet, and the amount sold in 1876 was 65,582,910 cubic feet, showing an increase of 8,574,890 cubic feet. The leakage has been reduced to a minimum; at all events it is very low, being about the same as the last half year. The return is 7¼ per cent., which I think Mr. Stephenson will tell you is very low. The cost of coal carbonized during the half year has been 35s. 3d. per ton; the cost in the corresponding half year of 1876 was 37s. 11d., showing a reduction in our favour of 2s. 8d. per ton. The state of our works, I am happy to say, is good. There is only the ordinary depreciation from wear and tear, which has been provided for. We shall have to repair one of our gasholders at some expense in the current year, after the monsoon. But for the loss on exchange we could have divided 1 per cent. more this year. You will bear in mind that we have been loaded with £20,000 worth of debentures. We have paid off £15,000, and we confidently expect to pay off the remaining £5000 on the 1st of January, so that the whole debenture debt will then be swept away, and the interest upon it will cease, and we shall then be in a much better condition. I do not know that I have any further remarks to make before moving the adoption of the report. I have only to give you the assurance that everything is going on satisfactorily in Bombay, and to say that a great deal is due to our zealous and active Manager there and our Officers at home.

Major Suart seconded the motion.

Mr. Lovejoy said he thought the stock of coals was very large. Of course, it was necessary to have a good stock, so as not to be taken by surprise; but he questioned whether it was quite judicious to have so large a stock as would suffice for eighteen months. He had understood that coals deteriorated in value, and he had found in his own household that the fresher the coals were, the better. If the coals were exposed for a long time to the atmosphere, a serious loss might be sustained, because so much gas could not be made from them as if they were new and fresh. He thought it better, in the long run, to take the chance of the market than to buy in large quantities because they could be obtained cheaper.

A Shareholder inquired what securities the Company had against defalcations from their officers at Bombay.

Mr. Penny said he had heard the report, and the observations of the Chairman, with very great satisfaction. The reasons that had been given why the profits were not greater were perfectly apparent, and they would weigh forcibly with him as an expert in regard to many other Companies with whom he was connected. Of course, if the price of coke went down, there would not be so much revenue from gas-rental. There was one thing, however, of which no mention had been made, but the importance of which Mr. Stephenson would recognize—he referred to the sale of ammoniacal liquor, which, in this country, was one of the most important residuals that a Gas Company had to deal with. A large revenue was being received from tar, and he hoped the time would come when the Company would see their way to do something with ammoniacal liquor. It was easily and inexpensively treated; and if it could not be sold in India, it might easily be disposed of somewhere else. With regard to the reserve-fund, he attached a great deal of importance to it; but he observed that the Directors had a pecular mode of dealing with it—first placing so much to the fund, and then writing something off for depreciation. In statutory Companies in England they were not in the habit of doing that. The reserve-fund was dealt with by itself, and was used for the purpose of equalizing dividends. The Legislature had recognized that a statutory Company were fairly entitled to a reserve-fund equal to 10 per cent. of their capital. His impression was that, having due regard to the interests of the Shareholders, the sooner the reserve-fund was filled up the better; because, although it was a sucker to begin with, after a time it became a feeder. When the reserve-fund was full and invested, the interest would become a portion of the revenue; if, on the contrary, it was used in lieu of working capital, so much the better. So long as it was safe and well cared for, it was, perhaps, better used as capital by the Company than invested. He ventured to suggest, for the consideration of the Directors, that the reserve-fund should be literally a reserve-fund, and stand by itself. If there was enough profit to put something by for the reserve-fund, and also to write off something for depreciation, so much the better; but he did not quite follow the method adopted. It appeared that during the half year £250 had been put to the reserve-fund, and that £273 had been written off—a larger sum than had been put to the fund. If the Directors had continued putting a larger sum to the fund than they took off, that would not be so bad; but he did not like to see the reserve-fund standing at a smaller amount than it did. There might, however, be reasons for the course adopted, and he did not make his remarks in any carping spirit. As a Shareholder, he was perfectly satisfied with the dividend given, and he did not ask for an increase. He had heard an expression of some impatience that the concern had not progressed more rapidly, and that the Directors were not in a position to give a larger dividend; but he was himself entirely contented with the amount offered, and whatever excess of profit there might be, he was willing that it should go to the reserve-fund.

Mr. Horrocks said that the items for chandeliers, brackets, and brass and iron goods, amounting to £10,400, appeared very large, and inquired whether any portion of that stock had been sold during the past year.

The Chairman said, with regard to the stock of coal, Shareholders would remember the time when, in the course of one year (the year 1873), the price of coal rose more than cent. per cent. The Directors had then foreseen that there would be an extraordinary demand for coal, and had provided more than two years stock, so that during that trying period they were sitting on velvet while their neighbours were in trouble. It was quite true that coal in Bombay did deteriorate by keeping; but the Directors had to consider not only the price to be paid for the coal, but the freights. It was when freights were low that they purchased large quantities. With regard to the question of security from the officers, the Manager in Bombay had given security to the extent of £2000, and the Accountant to the extent of £1000. The chief Collector had also given security, and he was responsible for the others. It was the custom to collect the accounts monthly, and no losses had been sustained. As to ammoniacal liquor, they had not yet been able to avail themselves of that product. The process would require the erection of chemical works, and he feared that the quantity of the liquor produced in the works would be insufficient to be worked profitably. As

soon, however, as they could see their way to carrying on the process with advantage, the Directors would not fail to do so.

Mr. PENNY said it was only the question of selling the sulphate, and the liquor could be turned into sulphate at little cost. He would promise an additional half per cent. dividend if the sulphate were utilized.

Mr. STEPHENSON: We have referred it twice to the Manager at my request, and there has always been a difficulty on his part.

Mr. PENNY: You must send him out the apparatus, and tell him to do it.

Mr. LINGING: The apparatus is simple and inexpensive.

Mr. PENNY: It is one of the great sources of revenue for a Gas Company.

The CHAIRMAN said the Directors would be delighted if a half or a quarter per cent. dividend could be realized by the ammoniacal liquor, and said that the matter should be borne in mind. With regard to the mode of dealing with the reserve-fund, that method had been adopted after due consideration; but he would promise that the subject should be re-considered. The item for chandeliers, &c., was much smaller than it had been, and the present stock was not larger than was absolutely wanted.

Mr. LINGING: I can recollect when it was £20,000.

Mr. STEPHENSON: £30,000.

The CHAIRMAN: We have looked very closely into it, and we will give the matter still further consideration.

The motion for the adoption of the report was then put, and unanimously adopted.

The CHAIRMAN proposed the re-election of Mr. Henry Palfrey Stephenson as a Director, and stated that that gentleman's services had been most invaluable to the Company, owing to his great experience and knowledge of gas matters, and his regular and punctual attendance at the Board.

Mr. LINGING seconded the motion, which was unanimously agreed to.

Mr. STEPHENSON, in acknowledging his re-election, said he desired to make one or two observations. He thought that the Company were making fair progress, considering that they had entered on a new contract in June, 1876, and had almost made "a leap in the dark." Their expectations had been thoroughly realized. A reduction had been made of more than £2 per lamp in the public streets, and also a considerable reduction in the price of private gas; and, notwithstanding that the previous dividend had been maintained, they could not, indeed, place the same large sums as before to the reserve-fund, but they were doing all they could in that direction. Of course they could not be responsible for the fall in the price of coke, which arose in a great measure from the fall in the coal market. If they had, however, more accommodated the price of coke to the fall in the coal market, they would not have had such a heavy stock on hand as they had on the 31st of December last—a stock which he hoped they would never see again. The Manager at Bombay, acting under the instructions of the Board, should continually keep the coke reduced so as to keep the yard clear, which he thought was the only true principle of selling coke. With regard to the question of depreciation of coal, there was no doubt that coal depreciated to a certain extent by keeping, but it was not the case with Australian so much as with English coal, and as a large portion of the supply was from Australia, they did not suffer so much from depreciation by having a large stock. Even supposing it amounted to 1s. or 1s. 6d. a ton, they had certainly saved from 8s. to 10s. a ton by taking up freights at their leisure, so as to get the advantage of low rates, instead of being obliged to take them up at any price. So far as the Company were concerned, there was no cause of anxiety in the prospect of war, because if it occurred they had a good stock of coal at low prices, and they would get good prices for coke. The contingency, therefore, of a large stock was all in their favour, and certainly not against them. With reference to the ammoniacal liquor, the Manager had been pressed on two or three occasions, and he had no doubt that the matter would again be seriously urged, in consequence of the observations of Mr. Penny. He did not see any difficulty in altering the reserve-fund in the mode suggested, and keeping it solely as a reserve fund. Mr. Penny had no doubt remarked that they had been writing off from the preliminary expenses at the rate of £400 a year, and that had been charged to the reserve-fund. He saw no reason why the fund should not be kept as a reserve to make up dividends, or to meet any special outlay. At present there were really three reserve-funds. There was the reserve-fund so called, and there was the insurance-fund, which had accumulated to £1687. The latter saved a great deal of trouble, as it enabled them to take their own risks on all shipments to the extent of £400 and under, and in a short time he hoped that they would be able, by means of the fund, to take all their sea risks, except in the case of coal, and in that case they would only take a portion of the cargo. There was also a passage-fund, which was in the nature of a reserve-fund, applicable to any passages. As to the stock of chandeliers, &c., when he first joined the Board it amounted to £30,000 or £35,000, and it was now only £10,000, and he did not think they could do with less.

Mr. E. G. Bradley and Mr. R. King were then re-elected as Auditors.

Colonel ROBINSON proposed a vote of thanks to the Chairman and Board of Directors. Although, he said, they had not been able to place the state of affairs before the Shareholders in as bright a light as they could desire, they were entitled to their gratitude for what had been accomplished in times like the present. With regard to the *bête noire*, the rate of exchange, he doubted, whether it would be better for some time to come.

Mr. PENNY, in seconding the motion, said he had been a Shareholder of the Company for many years, and he had watched its increasing prosperity with great satisfaction. A great proportion of it was, no doubt, due to the care with which the affairs of the Company had been administered.

The motion was unanimously adopted.

The CHAIRMAN acknowledged the vote of thanks, and said that the Directors had done their best hitherto, and they would continue to exert themselves for the best interests of the Company.

A vote of thanks was also given to the Manager, Secretary, and Staff, which was briefly acknowledged by the Secretary (Mr. W. Marshall), and the proceedings terminated.

SHEFFIELD UNITED GAS COMPANY.

A Special Meeting of Shareholders was held on the 6th inst.—Alderman MAPPIN in the chair—"for the purpose of considering the propriety of converting into capital the sum of £97,427, being part of the sum, by section 11 of the Sheffield Gas Act, 1866, authorized to be raised on mortgage, or some part of the said sum of £97,427."

The CHAIRMAN moved a formal resolution, creating 11,462 new shares of the Company, of £8 10s. each, to be called E shares. In the event of its being carried, he said the Directors would be able to allot every holder of £50 stock or share capital in the Company one of the proposed new shares, no matter whether the stock or share capital was fully paid up or not; and it was the intention of the Directors to make a call of £2 per share on the new shares on the 1st of July next. They considered they were entitled, in the interests of the Company, to avail themselves of the clauses which their Act of 1866 contained, and thus to repay the mortgage debt of £39,400 which now remained upon the undertaking. In the opinion of the Directors, the present was a suitable time for doing this. From his knowledge of the Company, he had no doubt they would be able to pay such a dividend upon the new shares as had been paid upon those previously created. The new shares would be subject to the conditions of the C stock and new £10 shares—*i.e.*, the dividend payable upon them would depend upon the price at which the Company supplied gas to the public.

The motion having been seconded,

Mr. SISSONS asked whether the mortgage debt was caused by the building of the new offices, or whether it was made up of several sums.

The CHAIRMAN: Certainly not. These mortgages have been created at different times, as the Directors thought it desirable to create them.

Mr. J. WILSON asked whether the new shares would take precedence of the £10 shares in the matter of future calls.

The CHAIRMAN said that matter had not yet come before the Directors. But his individual opinion was that, after the one call had been made upon the £8 10s. shares, the calls should return to the £10 shares.

The resolution was carried.

The CHAIRMAN next moved—"That calls shall be made on the said shares at such respective times, and be of such respective amounts as the Directors for the time being of the Company shall from time to time appoint."

Mr. T. WILSON seconded the resolution, which was put and carried.

Mr. T. WATERHOUSE moved a vote of thanks to the Directors and chief Officials of the Company. In doing so he said he entirely differed from those who believed that it would be to the interest of the town if the gas-works were in the hands of the Corporation. At Manchester, where the gas-works belonged to the Corporation, the price was 3s. per 1000 feet in the city proper, and 3s. 2d. outside the township, a reduction of 1d. per 1000 being made when the consumption reached 500,000 feet per quarter. In Birmingham, where the gas-works were also in the hands of the Corporation, the quality being the same as at Sheffield, the price was 3s. 1d., reduced to 2s. 9d. when the consumption was upwards of 100,000 cubic feet per quarter. At Belfast, where precisely the same conditions existed, the price was 3s. 9d., subject to certain discounts; at Liverpool, where the works were in the hands of a Company, the price was 3s. 6d.; and at Dublin, 4s. 6d. in the town and 5s. in the country. By comparison, he found that the lowest price in Birmingham was 2s. 7½d., and the highest 3s. 1d. In Sheffield, after next month, the highest price would be 2s. 7d., and the lowest 2s. 3d.; so that at Birmingham gas was from 16 to 18 per cent. dearer than it was here. In Manchester it was from 20 to 25 per cent. higher; and in Belfast it was 30 per cent. more. These were three instances in which the gas-works were in the hands of the Corporations. He was aware that at Manchester the Corporation made a profit of about £80,000 a year from the sale of gas, and expended it in city improvements; but he considered it was unfair to large gas consumers to have to pay more than they should, in order that improvements might be effected in the centre of the city, and not in the neighbourhood of their works. The price of gas should be regulated by what it was worth; and it was a ridiculous thing to take money out of one pocket, simply to put it in the other. If the Sheffield people liked to pay 2s. 10d. per 1000 feet for their gas, instead of 2s. 7d., in order to put the difference into the hands of the Town Council, it was, in effect, nothing more nor less than increased taxation. In conclusion, he said it was self-evident that gas-works in the hands of a private Company were much better managed than they could be by a Corporation.

The motion was seconded and carried, and having been acknowledged the meeting separated.

"IMPROVEMENTS IN THE MANUFACTURE OF CARBURETTED HYDROGEN AND OXYHYDROGEN GAS."

The above is the title of a patent (No. 4346) obtained by Mr. John Alfred Stephan, of Worcester, manufacturer, on the 20th of November, 1877, the specification of which, filed on the 18th inst., is as follows:—

This invention relates to the manufacture of carburetted hydrogen gas from water or sewage; also to the manufacture of oxyhydrogen gas partly from the resultants of certain portions of the process employed in the manufacture of carburetted hydrogen gas.

The process is as follows:—I employ a steam-boiler to contain the water or sewage, and I prefer for this purpose a form of boiler within or beneath which I can place a retort or retorts in such position that there is sufficient space between the boiler and the retort for the fire which is to heat both. Steam being generated from the water or sewage in the boiler, it passes by means of a syphon-pipe into one end of the retort; thus communication is maintained between the boiler and the retort. The retort is fitted with a honeycombed chamber formed of a mass of closely packed metal or perforated discs or tubes, beyond which is a carburetter consisting of any suitable carbon or carbonate; that which I prefer being layers of limestone placed closely packed in the retort at a slight distance from the metal chamber, and contained in a basket or cage to admit of its ready insertion into and withdrawal from the retort. By its passage through the limestone the hydrogen gas becomes saturated with carbonic acid.

A second carburetter is placed in the retort beyond the first named, and this may consist of any suitable material which contains a large proportion of hydrocarbon, such as bones, chalk saturated with petroleum, coal, coal dust, sawdust, or creosote; or any metallic carbonates may also be used for these carburetters.

The steam from the boiler thus passes into the retort by the syphon-tube already named, and is forced through the metal chamber, which, being heated, extracts the oxygen from the steam, leaving hydrogen, the oxygen having been deposited in the iron in the form of magnetic oxide.

The hydrogen then passes on through the first carburetter, which, as before stated, I prefer should be limestone, and which is to be placed at some little distance from the metal chamber, so as to generate an accumulation of hydrogen at that point, and thus create a pressure upon the carburetter.

At this stage—that is to say, when the gas issues from the carburetter—it is carburetted hydrogen, and burns with a reddish flame, but it has then to pass through the second carburetter of hydrocarbons, after which it will burn with a brilliant, clean, and white flame.

The residuals which are valuable pass—some in the form of vapour—up the pipe from the retort and into the condenser and cooler. Others are removed from the retort in their baskets or cages.

When sewage is employed in the process, one result of its boiling is the deposition in the boiler of a dry black pitch-like substance, which is nearly pure carbon—an inodorous hydrocarbon—and which forms a very valuable material to be employed as the second carburetter for the hydrogen to pass through. The heat causes an abundance of carbon to be given off from this substance, which carbon being absorbed by the lightly carburetted hydrogen, which the gas has become by its passage through the limestone, the gas is thus rendered highly luminous, incondensible, and permanent.

In making oxyhydrogen gas, the oxide formed in the metallic chamber in the process of deoxygenizing the steam, as before named, is to be decomposed by the employment of any suitable acid, thus producing pure oxygen, which, when combined in due proportion with the hydrogen, forms oxyhydrogen gas; and, in order to effect more readily the decomposition of

this oxide by the acid, I shut off the steam from the retort, and introduce a blast of atmospheric air, by which that which was a magnetic oxide becomes a red oxide, being a sesquioxide, or peroxide of iron.

The gas once generated, as it comes from the limestone, can be employed in place of any other fuel for producing further supplies.

The claims are—"Firstly, the improvements in the manufacture of carburetted hydrogen gas by decomposing steam, and carburizing or imparting carbon to the hydrogen gas resulting therefrom, substantially as herein described.

"Secondly. The improvements in manufacturing oxyhydrogen gas, as herein more fully set forth and specified.

CHRISTCHURCH (NEW ZEALAND) GAS, COAL, AND COKE COMPANY, LIMITED.

The Annual General Meeting of Shareholders was held at the Company's Offices, Gloucester Street, Christchurch, on Friday, the 1st of March last—Mr. E. G. Wright, Chairman of the Company, presiding.

The Secretary (Mr. R. C. Bishop) read the following report of the Directors:—

Your Directors are pleased at being able to place before the Shareholders upon this occasion a more satisfactory report than that of last year. This improvement is attributable to a more extended use of gas, consequent upon the extension of gas-mains throughout the city and its neighbourhood, and to the superior quality of the coal used. The Company having made experiments with the Grey River coal, find it can be used with great advantage.

During the past year the new holder and tank were completed; this holder is of a capacity of 101,000 cubic feet, and was brought into use in the early part of June, and is working satisfactorily.

The mains have been extended along Armagh Street, St. Asaph Street, Tuam Street, Hereford Street, Antigua Street, Worcester Street, Park Terrace, South Town Belt, Cathedral Square, &c., and to Avonside, covering new ground of more than three miles in length; and the necessary mains are fast coming to hand for still further extensions of about 4½ miles. New beds of retorts have also been fitted up, with satisfactory results.

The Company have imported a photometer, and with it many tests have been made, showing that the illuminating power of the gas supplied to the public is of an average of 17¼ standard candles, or of 22 Belmont sperm candles.

Your Directors place before you the usual statement of accounts, by which it will be seen that there remains for appropriation a balance of £3518 3s. 4d.; out of this sum your Directors recommend that a dividend be paid at the rate of 8 per cent. per annum on the paid-up capital, which will absorb £3200, and that the balance be carried forward.

It is proposed to make a further reduction in the price of gas, so as to make the net cash price to consumers 11s. 8d. per 1000 feet.

By rotation this year the retiring Directors are George Gould, Esq., and W. H. Lane, Esq. Both these gentlemen are eligible for re-election.

Dr.—*Balance-Sheet, Dec.* 31, 1877.

To Capital, viz.—			
4000 shares of £10, paid up	£40,000 0 0		
4000 shares of £10, no call made	40,000 0 0		
		£80,000	0 0
Debts due by the Company		302	3 6
Bills payable		2,238	8 7
Insurance-fund		148	0 0
Deposits at call		5,675	0 0
Bank of New South Wales		124	0 4
Balance		3,518	3 4
		£92,005	15 9

Cr.—*Balance-Sheet.*

By Immovable property—land and buildings		£4,516	14 0
Additions and improvements during the year		206	9 9
Cost of moveable property, being plant	£42,696 0 11		
Less written off for depreciation	2,000 0 0		
		£40,696	0 11
Capital available by call		40,000	0 0
Office furniture		86	9 7
Funds invested on mortgage		1,700	0 0
Shares in Investment and Loan Association		148	0 0
Debts due to the Company		1,995	17 6
Remittances to England connected with plant to arrive		1,424	16 6
Stock on hand—coal and purifying material		969	15 5
Gas-stoves		26	1 9
Cash in hand		235	10 4
		£92,005	15 9

Dr.—*Revenue Account, for the Year* 1877.

To Stock—Coals and purifying materials, Jan. 1		£924	1 8
Subsequent purchases of do.		4,286	4 6
		£5,210	6 2
Stock on hand, Dec. 31		969	15 5
		£4,240	10 9
Stock of gas-stoves, Jan. 1	£27 16 9		
Stock on hand Dec. 31	26 1 9		
"		1	15 0
eneral expenses, viz.—			
Wages	£2,046 9 9		
Salaries and fees	1,335 3 10		
Rent, taxes, and insurances	213 5 3		
Tools, materials, and repairs	171 16 7		
Stationery, advertising, and printing	59 18 10		
Miscellaneous	167 6 11		
		3,994	1 2
Estimated depreciation in plant		2,000	0 0
Discount and interest		1,547	17 5
Bad debts marked off		46	7 10
Balance		5,643	10 11
		£17,574	3 1

Cr.—*Revenue Account.*

By Sale of gas and rent of meters	£15,045	6 0
Sale of coke, tar, and sundries	2,491	18 1
Sale of gas-stove	1	15 0
Transfer fees	35	4 0
	£17,574	3 1

The Chairman, in moving the adoption of the report, congratulated the Shareholders on the favourable result of the year's proceedings. The coal formerly used produced only 9000 feet per ton; the present coal produced about 12,000 feet per ton. The grey coal was found to be very rich in gas, and the Directors hoped to largely increase the quantity used. A call was about to be made. This had been sanctioned, in compliance with the wish of new Shareholders, but he did not think the call was necessary, as money could be borrowed by the Company on very favourable terms.

Mr. Cowlishaw seconded the motion. With regard to the call, he thought it was against the interests of the Company to make it. It was, in his judgment, absurd to make a call simply to please an infinitesimal proportion of Shareholders. He had understood that the call would not be sanctioned till after the present meeting had been held. He hoped the Directors would rescind the resolution.

In answer to questions from Mr. E. C. J. Stevens, the Chairman, stated the proposed reduction in the price of gas was 10d. per 1000 feet. In the balance-sheet for the year appeared an item of credit for depreciation; this was the commencement of a policy of making an annual allowance for depreciation of plant, &c. Sixteen shares in the Investment and Loan Association had been purchased as the commencement of an insurance-fund. The average rate of interest allowed on deposits was 6 to 7 per cent., the bulk 7 per cent.

Mr. Stevens remarked that the Permanent Investment Society had reduced its rates to 5 per cent., and for fixed deposits 6 per cent.

Mr. Gould and several other Shareholders disagreed with the remarks of the Chairman and Mr. Cowlishaw relative to the call.

The Chairman stated that the largest number of new shares had been taken up by holders of old shares.

The report was then adopted.

The Chairman moved the payment of £3200 as a dividend of 8 per cent. per annum, the balance to be carried forward.

Mr. Cowlishaw, seconded the motion, which was agreed to.

Messrs. G. Gould and E. C. J. Stevens were then elected Directors for the ensuing three years, and both gentlemen briefly returned thanks, and Messrs. H. E. Alport and R. Walton were re-elected Auditors.

The usual honorarium to the Directors—£50 to the Chairman, and £150 to be divided among the remainder in proportion to their attendances—was voted.

The meeting then separated.

WATFORD WATER SUPPLY.

Mr. Edward Easton, C.E., has, at the request of the Water Committee of the Watford Local Board, made an inspection of the district, with a view to determine whether, in his opinion, any better plan than that already suggested can be devised for providing proper pressure for the high part of the district, combined with sufficient storeage.

In the report which he has submitted on the subject, he states that the population of Watford may be taken at 11,000, and the quantity of water supposed to be supplied, according to calculations based on the number of hours that pumping is carried on, 300,000 gallons daily. It is probable, he remarks, that this is not really more than 230,000 to 250,000 gallons per day, including Sundays. Looking at the probable increase of the town, 300,000 gallons per day may be taken as the maximum requirement for some years. The present storeage reservoir is wholly insufficient in size, and at too low a level for the highest parts of the district.

As mentioned in a former report, he considers that the site selected for the new reservoir at Bushey is the best that can be obtained, except at a great cost for a long length of main. The height of the ground at the spot chosen is 363 feet above Ordnance datum. The highest ground in the district is 265 feet above datum, and this is higher than any of the surrounding places that might possibly be included at some future time. The height of the highest cistern at Sunbury House is 287 feet above datum. Mr. Easton is of opinion that 40 feet in the clear should be provided, if possible, above the highest ground on which houses can be built, to the working level of the water in the proposed reservoir, that is, that such level should not be less than 305 above datum. This, he believes, can easily be managed at the site proposed, by constructing the reservoir of concrete and rubble work, the bottom of the reservoir to be 3 feet in the ground, or at a level of 300 feet Ordnance, and the top 12 feet above ground, or 315 feet above datum. This will allow of the water being drawn down till there are 5 feet left in the reservoir, and yet allow the 40 feet margin he has mentioned. Mr. Easton expresses an opinion that, if the new reservoir be constructed on this plan, it will give an ample pressure for every house at present built, and for every house that may hereafter be built, provided the cisterns are placed at a reasonable level.

In closing his report, Mr. Easton says he had thought of recommending the Board at once to adopt the system of Deacon's meters, of which he has the highest opinion, and which have been used with great success at Liverpool, Glasgow, and other places, but as it is not certain that the figures given him as to the present consumption of water in the town are entirely reliable, he has thought it would be wise to postpone this until the new engine and pumps are started, and the real quantity pumped ascertained.

Professor Attfield has made an analysis of the well water from the Watford Water-Works, and the following is his report thereon:—

London, 17, *Bloomsbury Square, W.C., March* 21, 1878.

This water is entirely free from the impurities which too commonly find their way into wells. Indeed, so far as any such matter is concerned, the water is even unusually and remarkably pure.

It is somewhat hard, and, therefore, not suited for cleansing operations in which soap is used, and it is not so well fitted as a softer water would be for general cooking purposes. The hardness also prevents it being classed as a water for boilers or general steam purposes.

The analytical data are appended:—

One gallon contains the following number of grains and decimal parts of a grain of the respective substances:—

Total solid matter dried at 212° Fahr.	28·00
Ammoniacal matter yielding 10 per cent. of nitrogen	0·01
Albumenoid organic matter yielding 10 per cent. of nitrogen	
Nitrites	None.
Nitrates, containing 17 per cent. of nitrogen	2·00
Chlorides, containing 60 per cent. of chlorine	1·60
Hardness (reckoned as chalk grains or degrees) removed on boiling	17·00
Unaffected by ebullition	4·00
Total hardness	21·00

(Signed) John Attfield.

WEST OF SCOTLAND ASSOCIATION OF GAS MANAGERS.

(*Continued from p.* 804.)

Mr. Dalziel (Kilmarnock) read the following paper

ON A NON-TILTING GAS-METER.

The subject I now bring before you—viz., that of a non-tilting gas-meter—is one, I am certain, which will be appreciated by many of my brethren. Happily some of us are so fortunately situated that a meter of this sort is not required. Others again, especially in manufacturing towns, have been much annoyed by parties tilting their meters, abstracting the water, and obtaining their gas at merely a nominal rate.

The custom of parties who are in the habit of doing this is, that after the Inspector has called and filled the meter with water, to let the meter register correctly for a few days, then tilt it forward, run off as much of the water as they can, and let it remain in that state till near the time they expect the Inspector to make his usual call; then the meter is set level, filled with water, and, as a matter of course, it is found all right when the Inspector calls, though he may be suspicious that the meter has been tampered with.

I am sorry to say that I have been much annoyed with consumers of this kind. I have been under the necessity several times of punishing, by fine, consumers for tilting and drawing water off their meters, and I have often failed in detecting parties of whom I was suspicious, on account of the hours they burned the gas, the size of the burners, or other circum-

stances, that the amount of gas registered was not anything like what it should have been.

During the winter of 1875-76, especially, my attention was directed to this matters. I was aware there were non-tilting meters that did their work efficiently, but the means taken were cumbrous, and not adapted for general use. I considered there ought to be a simple remedy to get the better of these parties, and, if possible, to make the pressure of the gas subservient to retaining the water in the meter, instead of blowing it out. In the non-tilting meter now before you I believe I have succeeded in obtaining this.

You are all aware the water in a wet meter is one of the sides of measurement, and it is only when the meter is standing level that it will give correct registration; the standard of the range in the water-line being 2 per cent. in favour of the company and 3 per cent. in favour of the consumer, being a range of 5 per cent.; but if we tilt forward a meter, this range can be increased to 10 per cent. or 12 per cent. in favour of the consumer. If we tilt forward a meter, the water in the measuring chambers of the meter flows forward into the front box, rises above the water level, and overflows into the waste water chamber, thereby lowering the water level in the drum of the meter only.

If we take a meter when newly filled with water, it registers 2 per cent. in favour of the company, but if we tilt this meter with a quarter of an inch underneath the hind feet, this will run off three-quarters of a gill of water, and register 1 per cent. less; with half an inch beneath hind feet it registers correctly.

With	¾	inch there is	2	per cent. slow	= a loss of	4	per cent.	
,,	1	,, ,,	3½	,, ,,	= ,,	5½	,,	
,,	1¼	,, ,,	5	,, ,,	= ,,	7	,,	
,,	1½	,, ,,	6	,, ,,	= ,,	8	,,	
,,	1¾	,, ,,	7	,, ,,	= ,,	9	,,	
,,	2	,, ,,	8	,, ,,	= ,,	10	,,	

And with 2¼ inches underneath the hind feet, the drum of the meter stops Up to this point, there are seven gills of water run off, or, roundly, seven-tenths of a gill of water for every quarter of an inch the meter is tilted, and an average loss of gas of 1¼ per cent. for every quarter of an inch of tilt. Now, when we have tilted a meter 2¼ inches, and run off the water to point, if we gently set back the meter to 1¼ inches of tilt, there is still this no registration, the drum of the meter standing still; now lower it to 1¼ inch tilt, and the meter moves off again, but with a loss of 10 per cent., which is equal to 12 per cent. from the highest point—viz., when the meter is newly filled with water, while at the same time the supply of gas is not in the least interfered with, the reason of this being that, although fully three-quarters of a gill of water is run off for every quarter of an inch put under the hind feet, the water level is lowered only at the back of the meter, the water level being, as it were, the centre point where the angles of the water-lines converge, and although a large quantity of water is drawn off the meter, the lowering of the level in the front box is inappreciable. Its level being scarcely altered, keeps the float up, and the gas entrance open, the gas passing right through the meter without causing the drum to move, and, of course, no registration takes place.

In the valve I now bring under your notice, I believe I have succeeded in producing an effective check on all who desire to obtain gas surreptitiously by tilting the meter and drawing off the water, as no gas can be got unless the meter is standing level.

Having fitted up several meters, I found Cowan's patent side valve most suitable for my purpose. The meters of other makers fitted with this valve did not do so well, as the action of the float was intermittent, the water rising and falling with the pressure of the gas, and permitting a portion of the water to flow into the waste chamber each time the float rose and fell; but with Cowan's patent side valve, the pressure in the water level chamber is constant, and does not permit the water to rise above the water-line when the meter is tilted, but is forced down by the pressure of the gas into the back of the meter, and kept there so long as the meter is tilted, the water-line in the water-level chamber being lowered to the same extent as the pressure of the gas; that is, if there is an inch of pressure, the level will be lowered in the level chamber half an inch; if two inches, one inch, &c.

In experimenting with a Warner and Cowan meter, by tilting it forward up to a certain point there is no loss to the Company; thus the meter standing level gains 2 per cent.:—

Tilted	¼ of an inch	1 per cent. fast.	As near as may be.
,,	½ ,, ...	1 ,,	
,,	¾ ,, ...	2 ,,	
,,	1 ,, ...	2 ,,	
,,	1¼ ,, ...	2 ,,	
,,	1½ ,, ...	2 ,,	
And at	1¾ ,, ...	the meter stopped.	

I came to the conclusion that, as the valve was intended for a certain class of consumers, Warner and Cowan's meter is most applicable.

In general the gas entrance to the drum of a meter is placed in the centre of the front box, between front and back. In this meter the gas entrance to the drum is brought close to the front plate, and a conical valve with back balance is placed on its mouth in the waste chamber of the meter. When the meter is standing level it is open, but when tilted forward, the balance, always hanging perpendicular, raises this valve and closes the mouth of the gas entrance to the drum, cutting off the supply of gas promptly; and, as before stated, the water, instead of flowing forward from the back of the meter, and rising above the water-line, and overflowing into the waste chamber, as in the common meter, is forced under the diaphragm back into the drum of the meter, and kept there so long as the meter is tilted, none of it overflowing into the waste chamber. The instant the meter is put into its proper position again, the water flows back to its natural level, and registration goes on correctly as before. I consider this to be a most important advantage—viz., the retention of the water when the meter is tilted. I would especially draw your attention to this point, which is one of the strongest recommendations to the use of this valve; it is as good as a spirit-level; you can set it to cause the gas to go out at any point, one-eighth or one-fourth of an inch; but I find for general use, with three-fourths of an inch of tilt, that is, under the hind feet, it is quite sufficient as a check on tilters, and is an ample margin to keep the valve open when the meter is sitting level.

Suppose, again, that the gas should be turned off, and the meter tilted, the water will run off, as it has not the pressure of the gas to retain the water; but as the valve, on the entrance to the drum, is closed, the supply of gas is effectually cut off, so there is no help for a consumer who tilts but to set his meter level again; but as the water has been drawn off, although the valve is open, down goes the float, and again cuts off the supply of gas, so there is no help for a consumer of this class but to fill up his meter with water, and let it stand level. By adding this valve to the meter, gas companies are doubly protected, and gas managers have an efficient check on consumers guilty of these practices.

I have got a number of Warner and Cowan's meters fitted with this valve, the working of which has been most satisfactory. Two years ago I put on some of Warner and Cowan's meters to several parties who were guilty of tilting; but it was of no avail, as, when brought forward, it is like other meters—viz., the compartments of the drum of the meter being unsealed by the water being run off. Seeing I had not improved my position, it was only after a good deal of time and trouble I have been able to circumvent them. In every case in which it has been applied it has wrought admirably. Now, when I have tested its efficiency, where I have the least suspicion, instead of watching, I put on a meter at once, and the result generally has been a large increase to the gas accounts of these parties, compared with the corresponding period of the former year. These parties, when they find the gas goes out if the meter is tilted forward, or if they draw water off the float goes down, will give up further attempts to obtain gas in this way.

A curious incident in connection with this is, that I invariably find those consumers who interest themselves in inquiring how much their neighbours consume, are fit subjects for a non-tilting meter. Their immunity from what their neighbours consider heavy gas accounts—who wonder how A could use so little and B so much gas, seeing that B went to bed early, and A sat up the most of the night—was a puzzle they could not get over. I now make it a rule, when the inspector comes across one of this class, who tell him they are only so and so, and inquisitive as to their neighbours accounts, to put one of these valve meters on at once, the result generally being a statement much in excess of what they used to pay.

As gas managers, those of us who have meter inspectors are much indebted to those who discharge their duties faithfully. The question is often asked, "How many cubic feet of gas do you make per ton of coal?" I think a more practical question is, "How much do you sell per ton?" as it is by what we sell our profits are made, so I consider a faithful inspector of meters is invaluable. Now that I have proved this meter to be effective, my inspectors find themselves relieved from one of the most disagreeable and irksome of their duties in connection with their office, as they have found that when a meter with this valve is put on to suspicious customers, it not only tells against the individual, but has a wholesome effect upon the neighbourhood. As a rule, you will find these parties are grouped together. When you find one in a locality, you may be certain others of the same sort are not far off.

I will now read you a few of the results of the working of the meter with this valve:—

Year.	——	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	Trade.
1877	Common Meter . .	—	—	200	200	200	700	200	300	300	Tailor.
1878	Non-tilting Meter .	—	—	600	500	400	500	500	400	300	—
1877	Common Meter . .	400	200	300	400	900	500	200	200	—	Brass Finisher.
1878	Non-tilting Meter .	—	—	—	—	—	—	—	—	500	—
1877	Common Meter . .	400	200	200	200	400	200	—	—	—	Engineer.
1878	Non-tilting Meter .	—	—	—	—	—	—	700	400	400	—
1877	Common Meter . .	—	—	—	—	600	600	500	300	200	Engineer.
1878	Non-tilting Meter .	—	—	—	—	900	1000	800	700	500	—
1877	Common Meter . .	—	—	000	800	000	500	300	200	100	—
1878	Non-tilting Meter .	—	—	300	700	600	600	300	300	200	—
1877	Common Meter . .	—	—	—	400	300	600	300	000	000	Hammerman
1878	Non-tilting Meter .	—	—	—	400	800	700	500	300	200	—
1877	Common Meter . .	—	—	—	—	—	300	300	200	100	One of small means.
1878	Non-tilting Meter .	—	—	—	—	—	500	600	400	300	Writer.
1877	Common Meter . .	—	200	300	300	300	400	300	200	100	Weaver.
1878	Non-tilting Meter .	—	400	700	800	700	900	600	400	300	—
1877	Common Meter . .	—	—	—	300	300	400	300	200	100	Engineer.
1878	Non-tilting Meter .	—	—	—	1000	1200	1400	600	1000	760	—

Now, what is the moral of all this? That we, as Managers, should do the best we can in furthering the interests—and these are genuine British interests—of our employers, not only in taking the most we can out of the coal and other materials supplied to us, but also to see to it, in the distribution, not only that our mains are sufficiently large and our service-pipes sound, but that our meters are the best that can be got, so that it will be out of the power of any consumer of gas to get more than he is entitled to, and that every company may realize every cubic foot of gas that passes through their meters.

The PRESIDENT: I am sure we are all indebted to Mr. Dalziel for his paper on this subject. It is one, however, that, perhaps, the least we say about it the better for ourselves, because many, if they knew how, might try their hands at tilting meters. At present very few practice this dishonest process; but at the same time it is well to have the power of checking these very few. Therefore, Mr. Dalziel deserves credit for the meter-valve he has invented. I would like to ask whether the gas-valve increases the price of the meter.

Mr. DALZIEL: I forgot to state that the parties of whom I have made mention were not caught tilting. It was only when we found neighbours saying they could not understand how So-and-so was charged so little for gas that the new meter was brought into play.

Mr. RICHMOND (Whitburn): Eighteen years ago I was greatly troubled by people tilting their meters; but I managed to put an end to the practice by introducing the dry meter. This meter is quite handy. I have not had a case of tilting for sixteen years.

Mr. CARLOW (Port Glasgow): The Port Glasgow Corporation bought a number of Mr. Dalziel's meters lately, and we have found them to be of great advantage. We were troubled with suspicions about parties, and we fixed these meters at their premises, and the results have been very satisfactory, although only a few months have elapsed since their introduction. I am not in a position to give actual results, but at some future meeting I will lay statistics before the meeting, to show the advantages derivable from the adoption of this meter.

Mr. AITKEN: I thought this was a question entirely pertinent to Kilmarnock, and that there was not another town in Scotland in which a Gas Manager could come forward and complain of his customers; but, from what we have heard, there are other towns in the same position, and perhaps you will consider, this being a question of morality, whether you should not inform the Commission about to sit as to the morals of such and such a place.

Mr. SCOTT (Superintendent of the Meter Department, Glasgow): I must say the principle of this meter is very good. I have much experience both of wet and dry meters, and I find the dry meter is very good where it has its work to do—that is, a 5-light meter passing 30 feet per hour; but if you take a fourth off that as being the quantity used for a certain time, it is a question whether the consumer does not get more than the quantity he is charged for. Therefore, I have always been in favour of the wet meter as the most correct measure in use—that is, always provided you get a perfect meter; and, so far as I have seen, this appears to me to be a very perfect measure. I may tell you that it is the Laidlaw meter that we principally use. The spout goes into centre of the cylinder. It does not matter how you tilt this meter, you cannot take off the water, because the spout is the water-line, and it is as near the centre of the measure as you can have it. And, tilt it as you may, the variation of the measure is very little—I do not think above 2 per cent. I would advise all Gas Managers, if they want accurate measurement, they should go in for wet meters, and test them regularly, and there is no fear of a good return. I have a system of testing dry meters in Glasgow. By means of a mechanical arrangement,

tested by experiments at the works, the Inspector can easily detect whether a dry meter is registering properly or not.

Mr. WATSON (Stirling): Is this meter of Mr. Dalziel a patent?

Mr. DALZIEL: It is merely registered.

Mr. WATSON: How many have you in use?

Mr. DALZIEL: I have a dozen just now; but I am getting more.

Mr. WATSON: Can you, by using this meter, reduce the per centage of unaccounted-for gas? I expect, if you had 200, or 300, or 1000 of these meters in use, that your leakage would be considerably reduced.

Mr. HUTCHISON (Portrush): From my experience nothing beats the old style of wet meter, provided proper attention is paid to it. With this attention there is no danger of the Company being defrauded. I must confess, however, that, when a Manager is dependent on Inspectors, who are mostly ignorant of the construction of a meter, there is nothing better than a good check. In that view I much approve of the principle of Mr. Dalziel's meter. When the index is taken, not by the Manager, as in small towns, but by Inspectors, it is invaluable that the Manager should have a meter on which he can place reliance. In comparing one year with another, I have found considerable differences in the returns, more especially with dry meters.

Mr. DALZIEL: The improvement only adds 5 per cent. to the cost of the meter. The most of the parties to whom I have referred have paid the additional cost in the first month. From my experience of dry meters, I will have nothing to do with them, if I can help it. I saw from the JOURNAL OF GAS LIGHTING that there was not a single dry meter in the whole of France. As regards the morality of Kilmarnock, that is a touchy point. The defaulters, however, are, in this instance, not Kilmarnock people; they mostly come from other places. Kilmarnock, therefore, is clear of this stigma. As to the reduction of leakage, I may say that Kilmarnock is a town that radiates from a centre in long streets, like a spider with long legs. I send the gas out from the centre in all directions, to the distance of one, two, or three miles; so that the leakage is about 14 per cent. I do not expect that the adoption of this meter will reduce the unaccounted-for gas very materially; but I consider that it is a meter which will make everybody pay what is right.

On the motion of Mr. LEVI MONK, a vote of thanks was awarded to Mr. Dalziel.

Mr. D. M. NELSON (Glasgow) read the following paper on

STEEL'S PATENT GRADUATORY GAS SCRUBBING, CONDENSING, AND PURIFYING APPARATUS.

In bringing the present short paper before this Association, it may not be out of place in me to say a word concerning the gentleman on whose behalf I appear, simply by way of introduction. Not that he is unknown in the world of engineering skill and enterprise, or that he has even been altogether isolated from the special section of engineering industry, to which we, as an Association, are more or less allied, but rather because he is, personally, somewhat of a stranger to most of you. I may say, however, that, as a practical engineer and a brewer, he has done much to improve the quality and cheapen our glass of beer or stout by his improvements upon refrigeratory and other apparatus; that one of his inventions is what is known as the Steel and M'Innes Railway Brake, a brake that has yet to be proved second to any other on trial at the present time; also that he has just published a work on brewing, which commands the price of ten guineas per copy.

Having thus briefly referred to these points in Mr. Steel's personal history, you may feel justified in believing that the process or system he propounds for the purification of gas is worth, at the very least, a few minutes of your consideration. He is desirous of gaining instruction and advice from you, while none the less willing to make himself useful to this or any kindred Association with which he may be brought into communion.

The machinery shown is meant to represent a method of purifying gas by what may be called a continuous graduatory process, and, at the same time, provide a simpler method of purification than at present in use. A pretty full description of this apparatus is given in the "Register of New Patents" column, JOURNAL OF GAS LIGHTING, March 26, 1878, page 488.

The system ought to be made up of two long cylinders, one supplied with pure water for de-ammoniating the gas, the other for extracting the sulphur and carbonic acid by means of lime water, or milk of lime. To show one of these cylinders will at present be quite sufficient for the purpose of explaining the arrangement, that cylinder being the one devoted to the cooling and scrubbing operation. The purifying process is quite similar, the liquid lime being used instead of the pure water. In both cylinders the absorbing media should travel the reverse way of that in which the gas travels, so that in reaching the end of discharge, the gas, in a state approaching to purity, meets the pure water, or clean milk of lime, entering and moving in the opposite direction, at the reverse ends. On its entering, the gas will, of course, encounter the absorbents, rendered as foul as can be allowed in practice, and ready for discharging. Thus the foul gas encounters the foul media of cleansing, and the pure gas the pure media.

The process is akin to what is called the "sparging" system, employed by brewers in the extraction of the saccharine products from malt—viz., that of sprinkling pure water on the top of the grains in the mash-tun, and causing it to filter downwards, absorbing as it goes the substance of the malt, and increasing in gravity as it passes towards the bottom, where it drains out in full strength. This sparging operation is performed vertically, and is much simpler than the method which must be employed with gas. Here we must work horizontally; and the writer thinks a perfect horizontal the best position in which to place the cylinders, as thus the absorbents will be retarded, rather than otherwise, in their passage through.

For the purpose of retardation, diaphragms are attached at suitable distances along the cylinders. These, it is supposed, will, while cutting the body of the liquor into sections, keep each sectional quantity very much by itself in the intervals between the periods of supply, and so have the strength or foulness, and that of purity of the absorbents, in a state of graduation from one end of the cylinders to the other, to secure for them the greatest amount of saturation at the point of outlet.

To describe the machine shortly, let us deal with one end for the ammonia. To this the gas is supposed to enter, and be supplied with water from a cistern, by means of cocks, together with some suitable pipe or connection. In action, however, previous to supplying pure water by the cocks, a quantity of liquor would have been drained off the opposite end of the cylinder and discharged into the tar pit or chest, through other cocks. The quantities run in and off must be measured in some way, and a general level maintained in the cylinders by arrangements of detail made for the purpose. Experiments are required to give dimensions.

After passing the ammonia cylinder, the gas enters the division for dealing with the sulphur, &c., and the action of the gas going the one way and the absorbent the other is repeated. The lime is supposed to be dissolved in a cistern, by some simple rousing apparatus, and run, as in the case of the water, into the proper end of the cylinder, there to move to the reverse end and be discharged into a pit or chest corresponding to that employed for the tar.

Objections were wont to be made to the use of lime in solution—its smell, and the difficulty in disposing of it, were both complained of; but a greater difficulty stood in the way—viz., the imperfect method of application. The writer has seen nothing better proposed than a fixed vessel, which, to fetch the principle home to us, might be called a pot for containing the wet lime, and into this, to some depth, as a necessity, the gas had to be forced for contact. Apart from the bad effects of forcing, the result was not good, for the gas went through in belches, and was but indifferently purified. This meagre purification, too, could only be had when the lime was newly put in and quite fluid, for it soon became too viscid to be penetrated, and too impure for purification.

The proposals of Mr. Steel obviate both the evils of viscidity and those of impurity, while recent proposals to use up effete gas-purifying products is likely to give a market for the contents of the liquid lime pit. In proof of this, I refer to an article which appeared in the columns of the JOURNAL OF GAS LIGHTING a week or two ago.

The question of whether the cylindrical or other shaped vessels should revolve, or be stationary, with shafts and arms to distribute the media of absorption, has been considered, but is not decided on by the patentee. The thorough mixing of the gas and liquor is of the first importance, but there are so many ways of doing it, that it is left in the meantime for discussion and experiment.

Fixed cylinders have the advantage that the fresh water, lime water, or milk of lime could be applied, and the products abstracted without any stoppage of machinery or the interruption of the process, while the rotating vessels will require special adaptations for this end. But this paper is read in the hope of showing a principle and means of gas purification yet virgin and untouched by gas makers, and which, it is thought, will give superior results to methods now being followed.

As regards the general improvement and simplifying of gas-making, (apart from purification) by the introduction of this system, it is supposed that the long purifying cylinders will allow of the condensers being done away with, as the exposure of the gas to the large superficies, with the thin material of the cylinders, will cool it amply in winter, and in summer the cooling deficiency can be made up artificially, by a sprinkling of water from pipes.

The cylinders being substitutes for the ammonia washer and the dry lime purifiers, it follows, if we can drop the condensers, that the cylinders at once take the place of all three. By this method all pressure is taken off the gas in its progress to the gasholder, and the only exhaustion required is the quantity of power to uplift this when being filled.

With the waste heat at disposal in the retort-flues of gas-works, the question of power to work this system need not enter into either calculation or discussion, and so with the cost of up-keep. This cannot be more than that required for the present apparatus, while the labour will be much less than that expended on the purifiers, &c., of the present day. It looks as if Mr. Steel's system was attracting the favourable notice of Gas Engineers, as one or two patents trenching upon his ideas have been taken out recently, and the writer will now be glad to hear the views of the gentlemen of the West of Scotland Gas Managers Association on the matter.

In continuation of my paper, I may remark further that Mr. Steel in his patent foresaw that revolving shafts might be used instead of the revolving cylinder, and he now thinks that the cylinders ought to be made larger in diameter than he at first anticipated—say 6 or 8 eight feet—so that men, in cleaning or repairing the interior, may be able to move about freely. Cylinders so large as this would be inconvenient to work on the revolving principle, and Mr. Steel now prefers the shaft with light arms to whisk the water about, mix the gas and water, and cause the gas even to strike down on the solid water creeping along the bottom of the vessel. In this case the vessel may be made round, square, or oval; possibly have a flat bottom, and a high oval or round top. With the flat bottom, the liquors might get a longer travel by moving zigzag, crosswise, with switching arms in each division.

But, as has been already indicated, the method is flexible in the extreme, and may be adapted to work in many ways. In these proposals, with the whisking arms and spoon or paddle-float ends partic[illegible]ly, there would be no need of wood grids, or other form of scrubbing p[illegible]er, so that the labour, great or little, would be restricted to that of keeping the bottom clear of obstruction.

After the reading of the paper, it was proposed to postpone further discussion until the next half-yearly meeting, when Mr. Nelson hoped to have an opportunity of bringing forward more information on the subject. This was agreed to.

EXHIBITS.

The thanks of the Association were accorded to Mr. Foulis for his kindness in sending his lamplighter, which was explained by Mr. Scott.

A vote of thanks was also given to Messrs. W. and B. Cowan, and Mr. Nelson, for the articles exhibited, and also to Mr. Christie, of the Argyle Ironmongery Company.

VOTE OF THANKS TO THE PRESIDENT.

Mr. MITCHELL: I have to propose a hearty vote of thanks to Mr. M'Gilchrist, for the able manner in which he has discharged his duties as President during the year which has just closed.

The PRESIDENT responded, and concluded by moving a vote of thanks to Mr. Carlow, Secretary, who, he said, had really done all the work.

Mr. CARLOW, in reply, said that in anything he had done for the Association he had had great pleasure, and he would always be glad to put his services at the disposal of the Association.

NEXT MEETING.

It was unanimously agreed that the next meeting should be held at Kilmarnock.

On the motion of Mr. NELSON, a vote of thanks was given to the Committee of the Industrial Museum, who, through Mr. Young, Curator, had done so much to facilitate the comfort and convenience of the members.

THE REVIVIFICATION OF LIME.

The members then adjourned to Paisley Gas-Works, where the Manager, Mr. G. R. Hislop, conducted them through the works, and explained his process for revivifying lime.

Having partaken of some refreshments,

Mr. HISLOP said: Mr. President and Gentlemen,—I very highly value the honour conferred upon me and upon our town, in having appointed Paisley as the place of your meeting at this time, and above all I feel grateful to you for having elected me an honorary member of your Association, and for the kind interest taken in my process for the revivification of spent lime, and for the expression of that interest which your presence here to-day conveys to me. In addition to the mechanical description of the lime-revivifying chambers, to which you kindly listened a few minutes ago, I am glad to have this further opportunity of making a few observations on the practical working and general results obtained by the process. At the outset I need scarcely advert to the many occasions, such as the present, upon which the subject of utilizing spent lime has been discussed—and that not only in Scotland, but in England

and elsewhere. You already know that I have for several years past been directing my attention to realize that object, and I venture to say that my efforts have not been fruitless; since, in addition to a considerable saving in the cost of lime, all the workmen can testify to the very great convenience that has been experienced in its use—considered in relation to the amount of land occupied by the raw material (limestone) and by the spent lime, which unitedly, in winter, commonly amounted to from 500 to 800 tons, and besides this, the exposure of men calcining stone during all seasons, and also the similarly disagreeable work of screening and preparing the new lime, which is very largely reduced in the preparation of the recalcined lime. The plan I follow out in ordinary practice is the employment of oxide of iron in conjunction with the lime, and by changing something like two of the former to one of the latter, the whole of the lime is completely desulphuretted by means of the carbonic acid contained in the foul gas. Lime that is employed in this way is found to contain, after some 56 recalcinations, only about 2 per cent. of sulphur. Another part of my process, and intended specially for works in which the purifiers are not arranged for the use of oxide of iron, is to draw, by a suitable exhauster, the carbonic acid gas from the chimney, and pass it up through the foul lime in the purifier, in order to displace the sulphuretted hydrogen, which is recovered, into oxide of iron contained in a separate purifier or chamber; and after recalcination caustic lime is recovered. I am presently making a certain series of experiments, and amongst these, that of recalcining lime fully saturated with all impurities, and after seven restorations it contains about 4½ per cent. of sulphur. My friend, Mr. Stewart, has had the process in operation in the Greenock Gas-Works for some months, and it continues to give satisfaction; but since its introduction there I have decided upon certain important modifications and improvements, which will, I feel confident, considerably increase the product of quicklime. Within these last few days Mr. Young, of Clippens, and myself have patented another arrangement, intended to take the place of the chambers you have just inspected—namely, a rotating or oscillating retort, as referred to by your President to-day, and which will be of special value to the larger Gas Companies and Corporations. It will be necessary only to feed in and draw out the lime, and consequently reduce the labour to a minimum. An ordinary boiler-shell is lined with fire-clay, and may consist of one or several tubes; and these, again, may have longitudinal or spiral ribs through them in order to expose the largest amount of surface. The tube is inclined towards a furnace and a receptacle for the burnt lime, and the heat given off during the process of cooling is utilized in increasing the temperature of the lime under recalcination. And something like 24 to 25 cwt. of quick lime per shift per man may be realized by my first process, and at about one-half of the original cost; probably considerably more by the rotating retort. In practice, from 50 to 60 per cwt. of the crude lime is returned as quicklime. With regard to the applicability of this process to small gas-works, it may be introduced with advantage into works of any size, from 3,000,000 feet per annum and upwards. It not unfrequently happens that a man has unavoidably to be taken into service when there is not more than half work for him, and until an increased consumption of gas brings his full complement of work, I would in such cases utilize his time by heating up the lime-revivifying chambers, and store up the burnt lime. As, depend upon it, you cannot err in having lime prepared a considerable time before its application in the purifiers, any carbonate that may form on its surface by exposure to the atmosphere being perfectly insignificant. In conclusion, I trust that our efforts will be crowned with that measure of success as will secure the profitable utilization of that material which has so long been held to be a nuisance and an abomination. In a word, I once more thank you, gentlemen, for having afforded me this opportunity of explaining my process.

THE DINNER.

In the afternoon a large company sat down to dinner in the George Hotel. Mr. M'Gilchrist discharged the duties of Chairman, the Croupiers being Messrs. Nelson and MacLeod. Song and sentiment succeeded each other, and a pleasant evening was spent.

LAMBETH WATER-WORKS COMPANY.

The Ordinary Half-Yearly General Meeting is to be held this day, when the following report of the Directors will be submitted:—

The accounts for the half year ended March 31, 1878, having being certified as correct by the Auditor appointed by the Board of Trade, under the Metropolis Water Act. 1871, and by the Company's Auditors, are now presented to the Shareholders.

During the half year, 1109 houses and other supplies have been laid on to the Company's works at a rental of £2309 6s.

The capital account No. 2, shows an expenditure in the six months of £16,565 11s. 1d., which leaves a debit balance of £4354 16s., but this sum includes the value of stocks in hand.

The bond and debenture debt at the end of the half year was £157,165, which has been reduced by the payment of £15,400 on the 1st of May.

The 4 per cent. debenture stock stood at £50,000 on the 31st of March, but has been increased by a third issue of £25,000, which was made payable in full on the 1st of May. For this issue applications amounting to £105,735 were received from 173 Proprietors, holding £338,025 share capital. The Directors allotted the stock, as before, proportionately amongst the Proprietors according to their holdings of shares. Fresh issues will be made by the Directors under the authority granted by special resolution of the Proprietors, at such times and in such manner as may be necessary for the purposes of the Company.

The surplus transferred from the revenue account, No. 3, to the dividend and interest account, No. 4, is £39,302 11s. 7d. After payment of interest on the bond and debenture debt and the debenture stock, there remains an available sum of £37,365 6s. 4d., out of which the Directors recommend to the Proprietors the distribution of a dividend for the half year ended March 31, 1878, at the rate of 6½ per cent. per annum, which, less the income-tax, will, it is estimated, amount to £34,630, leaving a balance of £2735 to be carried forward.

The Engineer reports the completion of the duplicate 12-inch pumping-main from the Brixton works to Selhurst reservoir, referred to in the last report, and that the whole of the Company's works, including reservoirs, pumping-engines, main-pipes, &c., &c., are in good repair and efficient working condition.

Notice has been given of the Company's intention to begin giving a constant supply of water to the town district. The locality selected for making a commencement being that lying between the Kennington Park and the Walworth Roads, in the Parish of St. Mary, Newington. When the house fittings are in order, and the constant supply effected in this block, the system will be gradually extended over successive blocks or divisions of the district, until the whole is supplied on the same system.

The Directors have to report that the staff of the Company is now concentrated in commodious and convenient offices, at the works, Brixton Hill, and that the lease of the old offices in Kennington Park Road has been disposed of.

The Metropolitan Board of Works, as the Proprietors are aware, introduced two Bills in Parliament at the beginning of the present Session, with the object of obtaining the control of the London Water Supply. The public Bill for the acquisition of the Companies, by purchase on an open arbitration, was manifestly unjust. The private Bill for the introduction of a high-pressure supply, to be obtained from distant sources, for drinking and fire-extinguishing purposes, appeared to be a scheme which was certainly ill-considered and probably utterly impracticable. These Bills have now been withdrawn, but all the Metropolitan Water Companies have been put to very considerable expense in opposing them; and much public money must have been expended by the Metropolitan Board of Works in their promotion. The public consideration of the question, however, has elicited the fact that the water supplied by the London Companies is extremely good in quality and ample in quantity. As evidence that the requirements of the public have been of the first consideration to the Directors and Proprietors, it may be here stated that £392,582 4s. 6d. have been expended on capital account by the Lambeth Company since March 31, 1871 (when the Metropolis Water Act was passed), with the object of maintaining and improving the purity of the water, and increasing the facilities of its storage and distribution.

The following Directors, Mr. John Deedes, Mr. John Boustead, Mr. Edward Thomas Edmonds Besley, and Mr. Robert Stopford, retire by rotation this year, but, being eligible, offer themselves for re-election.

The Auditor who retires by rotation this year, and who offers himself for re-election, is Mr. Burroughs Dickie Kershaw.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The coal trade throughout this district continues in a very depressed condition, and, to effect business, sales have to be pushed at extremely low prices. This is especially the case with regard to gas-making coals, and the general complaint is that the business doing in these is of a very unsatisfactory character, as the keen competition for contracts prevents anything like a legitimate price being obtained. The better classes of round coal, suitable for house-fire purposes, are, of course, only in very moderate demand, and the depression in the iron trade, together with the strike at the cotton mills, causes other classes of fuel to be a complete drug in the market. Prices generally have a downward tendency, and in the Manchester district reductions in the list rates, to come into force at the end of the present month, have been decided upon by the leading firms; whilst in other districts prices are gradually being cut down to meet the demands of consumers. The average quotation at the pit mouth may be given at about 9s. to 10s. per ton for best Wigan Arley, 7s. 6d. to 8s. for common ditto, 7s. to 8s. for Pemberton four-feet, 5s. to 6s. for common coal, 4s. 6d. to 5s. for burgy, and about 3s. 6d. per ton for good slack.

The reduction of wages in the Oldham district has led to a turn-out of the men. The notices expired on Wednesday, and on Thursday the miners at about 14 pits struck work.

The iron trade shows no sign of improvement, and there is very little doing either in the raw or manufactured materials. Some of the outside brands of pig iron continue to be pushed in this district at such low prices that local producers have little or no chance of securing business, and stocks are accumulating at the Lancashire works, but nominally the list prices are without change. In finished iron the makers of the better brands are generally steady at late rates, but low-class irons are offered at very low figures.

Works are all very slack, and many of them are partially stopped.

Messrs. Dobson and Barlow, of Bolton, one of the largest ironfounding firms in the district, have served notices on their men of a reduction in wages of 5 per cent.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The coal trade of the North of England alters very little; the demand for best gas coals at a few of the leading Durham collieries is pretty steady for the season of the year. All the other collieries have a "scrambling" sort of time of it. Second-class gas coals are sold for manufacturing, steam, or whatever sort of use people are inclined to put them to. "No reasonable offers are refused" by colliery offices. Quotations are about as follows:—Best, 7s. to 7s. 6d.—mostly 7s.—per ton, less 2½ per cent. discount; seconds, from 6s. to 6s. 6d. per ton, with the same discount. The steam coal trade is fairly well, especially for best sorts for exportation to India and the Mediterranean. Rates are—Best, 10s. per ton, with from 2½ to 5 per cent. discount; seconds, from 8s. to 8s. 6d. per ton, with similar discounts. Shipping turns for gas are ready; it may be written immediate. Notwithstanding that there was a scanty supply of vessels in the coal ports last week coasting rates favoured shippers; there were few orders in the market. From 5s. 1½d. to 5s. 3d. per ton was paid sailing vessels to load gas coals to be delivered at the wharves in London river. The figures for steamers were from 4s. 3d. to 4s. 6d. per ton for London. Little more than 5s. a ton was offered to sailing vessels to load coals for the east coast; rates were extremely low for the Channel ports also. There was a rise of about 10s. a keel in coal rates to Cronstadt. There was no change in freights to the lower ports of the Baltic; there was a fall, however, of from £1 to £2 a keel upon the freights of coal exported to the Mediterranean and Black Sea.

The external prospects of the coal trade alter very materially with the rise and fall in the political situation. If there were a settlement of the Eastern difficulty there would to some extent be a revival of prosperity in the iron trade, and a better coal trade. The iron trade of the North is likely to be subject to a good few changes. Steel rails are in request, and some of the factories in Middlesbrough are about to be changed from manufacturing iron to steel works. The iron trade is without any material alteration; it is extremely quiet.

There is little demand for fire-clay goods, fire-bricks, cement, manufactured iron for furnaces, or machinery for factories abroad, and the shipments by steamers to the Continent are limited. Some part cargoes of Cleveland pig iron were sent from the Tyne last week to Rotterdam, Cronstadt, and some other foreign ports. Gas and water pipes were shipped for abroad and the South of England, but the shipments were not large. The chemical market is extremely dull.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The report of the analysis of gas supplied to the city of Edinburgh on the 14th inst. showed that the illuminating power of that supplied by the Edinburgh Company was 27·50; Edinburgh and Leith Company, 28·0.

A meeting of the Committee of Management of the Forfar Gas Corporation was held last Thursday, when the subject of insuring the works was under consideration. From a report which was submitted, it appeared that of the eight towns that had been communicated with, four of the gas-works, were not insured; in the case of the other four, the subject was either under consideration, or the works were partly insured. The Committee resolved to consider the propriety of insuring the offices at the works. Regarding the proposed adoption of the Sales of Gas Act, it

appeared that in the same eight places, seven had not adopted it, and one had been working under it since the year 1860. It was resolved not to adopt it.

In his report upon the quality of the gas supplied to the city of Glasgow during the week which ended the 18th of May, Dr. Wallace states that the minimum illuminating power ranged from 26·20 candles to 27·38 candles, the average from 26·64 candles to 28·13 candles, and the maximum from 27·05 candles to 29·01 candles. In all cases, the highest results were again shown in the western district. Very good results were also shown at the southern testing station.

The Directors of the Dunbar Gas Company have resolved to reduce the price of their gas as from the 15th inst., the reduction being from 7s. 6d. to 6s. 8d., or 10d. per 1000 cubic feet.

At the annual general meeting of the Shareholders of the Buckie Gas-light Company, Limited, which was held on Tuesday week, a dividend of 5 per cent. was declared for the past year. From the Directors report, it appeared that there had been an increase in the consumption for the year of considerably over 100,000 cubic feet, and that the price had been reduced from 10s. 10d. to 10s. per 1000 cubic feet, with the usual discount to consumers as heretofore.

The Greenock Corporation Gas Committee have resolved to erect a dwelling-house for their Manager, in proximity to their new works, at a cost of about £1400.

The Greenock Water Trust met last Tuesday, on which occasion attention was called to a communication from the Engineer, suggesting a reduction in the rates charged to parties using water for motive power during the quarter from November to February, at which season of the year there is usually a large quantity of water running to waste. It was thought that many would take advantage of the water if the rate was reduced. The communication was allowed to lie over till next meeting. From the Superintendent's report, it was shown that there was 129 days supply of water in the various reservoirs.

At a meeting of the Largs Burgh Commissioners, last Tuesday, Mr. Hadden, C.E., gave in a statement of the progress of the new water-works, from which it appeared that, although the pipes were not in a thoroughly satisfactory condition, rapid progress was being made, and certain districts, including the principal streets of the town, were ready for house connections being made. Mr. Hadden was of opinion that another week would see all the pipes in proper order. About a dozen burst pipes had been got together, with many defective plugs.

The Police Commissioners of Leven, Fifeshire, have resolved to procure an additional supply of water to the town, by constructing filtering-beds, and a tank to contain 28,000 gallons, which, together with the necessary piping, are estimated to cost about £670. The supply will be about 30 gallons per head per day for a population of 4000, and the present population of Leven is 3000.

During the fortnight preceding the 21st inst. the delivery of water into Edinburgh was at the rate of 5544·70 gallons per minute, which is equal 27·28 gallons per head per day to a population of 292,500.

The Glasgow pig iron market was again extremely depressed during the past week, and as low as 48s. 11d. per ton was taken for warrants. At the close on Thursday, however, there was some improvement, buyers offering 49s. 1d. cash, and 49s. 3d. one month.

No improvement can be reported in regard to the Glasgow coal market, and even with the great number of pits idle, there is not the demand requisite to take off the existing supplies.

Sales of Provincial Gas Shares.—On the 16th inst., eight original A shares (£10) in the Eastbourne Gas Company were sold by auction, and realized £18 5s. each, two £18 2s. 6d., and four B shares, restricted to 7½ per cent. interest, £13 10s. each. On Friday last, 50 £25 shares (paid up) in the Epsom and Ewell Gas Company were sold by auction, and realized £29 10s. each.

Sale of New River Shares.—On Tuesday last, Messrs. Fox and Bousfield offered for sale, at the Mart, Tokenhouse Yard, 30 £100 shares, fully paid up, in the New River Company. On submitting the property, the Auctioneer stated that the income of the Company last year was £15,000 more than the previous year, and that the present income is double what it was 12 years ago. The shares offered were all readily purchased at £330 each, representing a premium of £230 per cent. Every class of shares in this Company appears to be at an enormous premium. The nominal value of the King's shares, and what are known as the Adventurers shares, was fixed by Act of Parliament in 1855, when the Company applied for power to create new shares, at £21,000, and last week one-quarter of an Adventurer's share and one-quarter and one-fifth of a King's share, were sold at prices representing £93,000 as the value of a whole share, being a premium of between 300 and 400 per cent. in little more than 20 years. On Thursday, Messrs. Chinnock, Galsworthy, and Chinnock, offered for sale by auction, at the Mart, 32 New £100 shares, fully paid up. Most of the lots were sold at £330 to £335 per share.

Gas Lighting in Barbadoes.—His Excellency the Governor of the Windward Islands has transmitted to the House of Assembly a petition addressed to him by the resident Engineer and Manager of the Barbadoes Gas Company (Mr. R. K. Moorhouse), praying the Governor to recommend the grant of a subsidy of £3250 per annum for a period of five years, on certain conditions, to enable the Company to undertake the lighting of Bridgetown and its suburbs. The petition states that the Company were established some years since; that in 1873 they were incorporated with the exclusive privilege of erecting gas-works in Bridgetown, and that, in accordance with their special Act, they have laid out a large amount of capital in the erection of works and laying mains through nearly all the streets of the city. They already supply a number of private consumers and some of the Government departments, and have, from time to time, applied to the Vestry of St. Michael to avail themselves of the means now offered by the Company for lighting the city. The Vestry, however, consider that they have not sufficient power to justify them in entering into such a contract with the Company. Hence the appeal to the Legislature. The Company, in consideration of a grant of £3250 per annum, state that they will undertake to supply gas for 200 lights for the city of Bridgetown, lighted 300 nights in each year; providing and fixing at their own cost all necessary pipes, posts, brackets, lamps, and other necessary fittings, and keeping in repair the same for the space of five years. They will also supply the Central Police Station, Magistrates Offices, the six minor Guard Houses in the city and suburbs, the Fire Brigade Stations, Government House and its approaches, Market Hall area, and Glendairy Prison (fitting up on the most approved style all passages, cells, entrances, &c., similar to those in England); and will supply all necessary pipes, fittings, brackets, lamps, posts, &c., and keep in repair and maintain a lighting system throughout, to the satisfaction of the Authorities. They state further that, at the expiration of the term of five years, they will inspect and put in thorough good order all the pipes, fittings, &c. (save and except the street-lamps, posts, &c.), and hand them over to the several Authorities, without any further charge. The Company submit that, if this system of lighting the city and other places is carried out, they will be able to produce gas at a much cheaper rate than they can at present, which will enable them to supply it to customers at a very low price. In support of this application by the Company, a petition, signed by nearly 300 Merchants and others in the city, has been sent to the General Assembly, urging the House to take the matter into their favourable consideration, and adopt such measures as will enable the Company to carry their scheme into effect. The Governor, in transmitting the Company's petition to the Assembly, writes: "It will be for the House to determine, in considering the ways and means for the current year, how far they will be justified in accepting, as a whole or in part, the proposal thus placed before them."

Register of New Patents.

APPLICATIONS FOR LETTERS PATENT.

1958.—Newton, H. E., Chancery Lane, London, "Improvements in filtering apparatus." A communication. May 15, 1878.

1963.—King, C. W., Chester, and Cliff, A., Liverpool, "Improvements in and appertaining to valves, and to the method of actuating and governing them, such improvements being applicable to the valves of motors and pumps, known as the three-cylinder type, and also applicable in part to other types and classes of engines and pumps." May 16, 1878.

1997.—The Hannoversche Maschinenbau Actiengesellschaft (vormals George Egestorff), Linden, Prussia, "Improvements in gas-engines with two pistons." A communication. May 17, 1878.

1998.—Lake, W. R., Southampton Buildings, London, "Improvements in motor-engines to be driven by water or other fluid pressure." A communication. May 18, 1878.

2003.—Haddan, H. J., Westminster, "Improvements in apparatus for the generation and application of electricity for lighting, plating, and other purposes." A communication. May 18, 1878.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

4323.—Pieper, C., Dresden, "Improvements in the apparatuses for the purification of coal gas." A communication. Nov. 19, 1877.

4423.—Gordon, J., Glasgow, "Improvements in apparatus for controlling and regulating the supply of water and preventing waste." Nov. 21, 1877.

4479.—Aube, P., Toulon, France, "Improvements in the manufacture of gas and in apparatus used in its production." Nov. 28, 1877.

464.—Johnson, J. H., Lincoln's Inn Fields, London, "Improvements in valves or apparatus for reducing or regulating pressure." A communication. Feb. 5, 1878.

755.—Peebles, D. B., Bonnington, N.B., "Improvements in apparatus for governing or controlling the flow or pressure of illuminating gas and other fluids, and in part relating to the testing of gas." Feb. 23, 1878.

835.—Parfitt, J. S., King's Heath, Worcester, "Improvements in pressure-gauges." March 1, 1878.

891.—Barrow, J., Clayton, Lancs, "Improvements in manufacturing ammoniacal salts and utilizing certain waste products." March 5, 1878.

PATENTS WHICH HAVE BECOME VOID.

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

1599.—Jennings, J. G., and Pocock, A. W., "Improvements in liquid-meters." April 30, 1875.

1621.—Haigh, B., "Improvements in cocks or valves." May 1, 1875.

1625.—Pape, T., "An improved method of and apparatus for filtering and deodorizing sewage, so as to prevent rivers being polluted thereby." May 3, 1875.

1729.—Gordon, J., "Improvements in waste-preventing stopcocks or valves." May 10, 1875.

1752.—Hallsworth, S., and Bailes, R., "Improvements in purifying illuminating coal gas, and in the preparation of the means employed therefor." May 11, 1875.

PATENTS WHICH HAVE BECOME VOID.

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

1207.—Lake, W. R., "Improvements in the construction of draught tubes or globes designed to be used as a substitute for the globes ordinarily placed on gas-burners." May 4, 1871.

1247.—Warsop, G., "Improvements in pipe-wrenches." May 9, 1871.

TO GAS ENGINEERS.

D. BRUCE PEEBLES & CO.

Beg to call the attention of Gas Engineers to the fact that the novel and original feature in connection with PEEBLES' SYSTEM OF CONTROLLING THE ACTION OF GAS GOVERNORS is the loading or acting on the Bell by Pneumatic Pressure instead of Weights.

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The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, and TWO MEDALS at the PHILADELPHIA EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

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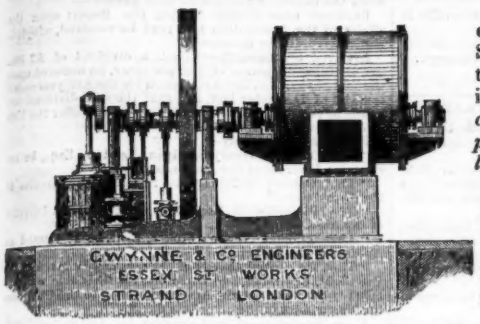

EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

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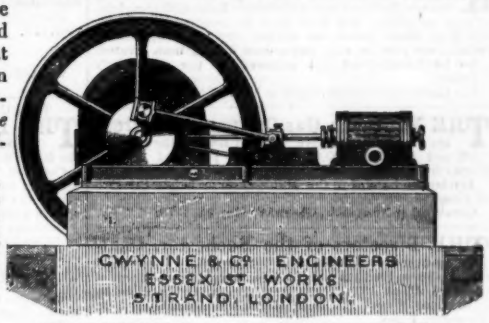

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Exhausters, with or without Engines combined, can be made to pass the gas without oscillation or variation in pressure Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

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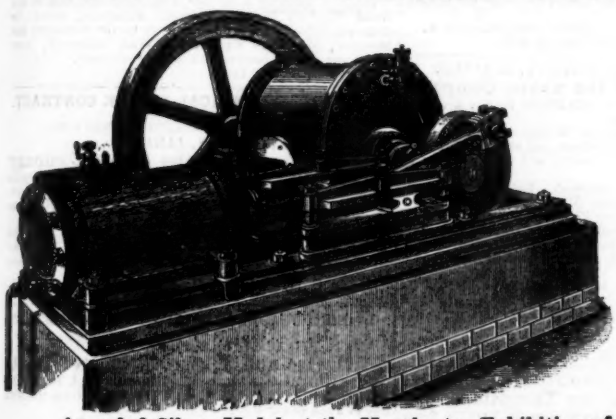

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This Company is now in a position to raise **2000 tons per day of REAL OLD SILKSTONE GAS COAL.**

"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.

Prices quoted to any Railway Station, or F.O.B. Hull, Grimsby, Goole, Keadby, Liverpool, and Fleetwood.

Full particulars will be sent on application to above address.

WANTED, a Steady Man as Foreman STOKER in a country Gas-Works making 25 millions per annum. Will have to attend to Engine and Exhauster.

The Works being in good working order, the salary will depend upon results. First-rate testimonials indispensable.

Apply, by letter, to No. 461, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

A Young Man, aged 22, who has jus finished a four years engagement with a provincia Gas Company is open to take a situation as Manager of small Gas-Works, or as Assistant to the Engineer of large Works. Can give first-class testimonials. Has no objection to go abroad.

Address No. 460, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ON SALE—A Station-Meter (with new Drum), capable of passing 10,000 cubic feet per hour, with Hydraulic Valves, Bye-Pass, &c.; 10-in. Connections. Has been removed to make room for one of larger capacity.

For particulars and price, apply to GEORGE NEWTON, Gas-Meter Manufacturer, Union Street West, OLDHAM.

NOTICE.—W. M. Barratt is not now, nor has he been employed on the Berkeley Gas-Works since April 26, 1878, and is not in any way connected with them.

JOSEPH MOFFATT, for the Proprietors.

TO GAS COMPANIES, LESSEES, &c.

THE Advertiser, at present Assistant Manager of a Provincial Works, seeks a Re-appointment as MANAGER of a small, or Assistant in a large, Works. Several years practical experience. Unexceptionable references, and good reasons for leaving present employment.

Address No. 462, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ON SALE—One Station-Meter, to pass 1000 cubic feet per hour. Almost new. Will be sold cheap.

Apply to J. HALL, Gas-Works, St. Helen's, LANCS.

GASHOLDER, now at work, and in good condition, FOR SALE; 45 ft. diameter, 18 ft. deep; Six Columns and Girders, with Chains and Balance-weights.

Apply to the Horseley Company, Limited, Tipton, STAFFORDSHIRE.

FOR SALE, One New 6-inch Centre-VALVE, by Messrs. C. and W. Walker (patent), with service connections. Has not been fixed.

One STATION-METER, by Messrs. J. and J. Braddock, Oldham, for 6-inch connections, to pass 8000 feet per hour. Has been in work five years; in first-class condition.

For particulars, apply to HENRY CLARKE, Secretary, Gas Company, Maldon, ESSEX.

RIPON CORPORATION GAS-WORKS.

EXHAUSTER for Sale (by Dempster), with Engine, Bye-pass Valve, and Governor complete, capable of passing 3000 cubic feet per hour. Has been five years at work, and is in good repair, being sold to make room for a larger one.

Apply to GEO. IRVINE, Gas-Works, RIPON.

THORNE GAS COMPANY, NEAR DONCASTER.

TO BE SOLD—Two Purifiers, 6 ft. by 3 ft. 6 in., with Covers and Wrought-Iron Grids complete. Also a 6-way Hydraulic Centre-Valve, with 6-in. Inlet and Outlet complete.

The whole in good condition, and for sale in consequence of larger ones being put down.

Apply to JOHN ACASTER, Secretary.

CORPORATION OF BIRMINGHAM.
GAS DEPARTMENT.

AN Exhibition of Gas Apparatus will be held in the Town Hall, Birmingham, from Wednesday, the 5th, to Tuesday, the 11th of June next.

The prices of admission will be as follows:—

June 5	from 2 p.m.	to 6 p.m.		2s. 6d.
,,	6 ,,	,, 10 ,,		1s. 0d.
June 6	11 a.m.	,, 5 ,,		1s. 0d.
,,	5 p.m.	,, 10 ,,		6d.
June 7, 8, & 10	11 a.m.	,, 5 ,,		6d.
,,	5 p.m.	,, 10 ,,		3d.
June 11	11 a.m.	,, 10 ,,		3d.

EDWIN SMITH, Secretary.

SPENT OXIDE OF IRON.

TO BE SOLD—About 40 or 50 Tons.

Samples and particulars may be obtained on application to W. UPTON TINNEY, Manager, Gas-Works, WINCHESTER.

GODALMING GAS-WORKS.

A Set of Three 6-feet Square Purifiers,

Sieves, Lifting-Gear, and Centre-Valves, all complete, in good condition, and have been in constant work up to the 15th inst. (made by Cockey and Son, Engineers, Frome), are now for sale, larger ones having been erected.

To be taken down and removed at the purchaser's expense.

For further particulars, apply to Mr. A. COPPUS, Secretary

THE Nantwich Gas Company, Limited,

are prepared to receive TENDERS for the surplus TAR and AMMONIACAL LIQUOR produced at their Works from the 1st of July.

Tenders to be sent to the Manager on or before the 15th of June.

Gas-Works, Nantwich, Cheshire, May 25, 1878.

THE Directors of the Rochester, Chatham, and Strood Gaslight Company have for disposal two six-horse Engines and Boilers, recently thrown out of use, and about 150 Retort Mouthpieces, Ovals, 21 in. by 15 in.; and Rounds, 15 in. by 15 in.; with Outlets for 6-in. Ascension Pipes.

The articles may be seen on application at the Office.

Tenders for the whole or any part of the above, marked "Tender for Materials," may be sent not later than Wednesday, June 12, addressed to the Secretary, at the Office, 56, High Street, Rochester.

The Directors do not bind themselves to accept the highest or any tender.

WILLIAM STRS, Secretary.

May 17, 1878.

AMMONIACAL LIQUOR.

THE Directors of the Barnsley Gas Company are prepared to receive TENDERS for the AMMONIACAL LIQUOR produced at their Works in Barnsley and at Old Mill, for a period of One, Two, or Three years, from the 1st day of July next.

Probable quantity, and any other particulars, may be had on application to the undersigned.

Tenders, addressed to the Chairman, to be sent to me not later than Thursday, June 6, 1878.

JOHN HUTCHINSON, Manager.

Gas Office, Barnsley, May 13, 1878.

TENDERS FOR GAS COAL.

THE Corporation of Walsall invite TENDERS for the Supply of 20,000 Tons of Staveley, Yorkshire, or any other good GAS COAL, to be delivered between the 1st of August next, and the 30th of June, 1879, either at Walsall Railway Station or by boat at Walsall Old or New Gas-Works; in the latter case it will also have to be unloaded and stacked in the coal-shed, or such other place at the Gas-Works as may be directed.

The Coal will have to be delivered at the rate of from 180 to 700 Tons per Week, as the Corporation may from time to time require. The weight, if delivered by rail, must be 2352 lbs. to the ton; if by boat, it must be 22 cwt. to the ton, boat gauge.

Payments monthly.

The Corporation do not bind themselves to accept any tender, and they reserve the right to divide the contract between several firms.

Tenders sealed, and marked outside "Tender for Gas Coal," and stating the price for large Coal and also for Nuts (and also stating the price if delivered on the Corporation siding at the New Gas-Works instead of at Walsall Railway Station), are to be sent to the undersigned, on or before Thursday, the 6th of June next.

SAMUEL WILKINSON, Town Clerk.

Bridge Street, Walsall, May 16, 1878.

CONTRACTS UNDER THE LEEK IMPROVEMENT ACT, 1855.

THE Leek Improvement Commissioners invite TENDERS in respect of the following Contracts:—

No. 1.

For the Purchase by them of a Supply of Best GAS COAL, screened over an inch screen, for One, Two, or Three years, from the 1st of July next, to be delivered at the Leek Station on the North Staffordshire Railway, at such times and in such quantities as may be required. Annual consumption 3500 to 4000 Tons.

Sealed tenders, endorsed "Tender for Gas Coal," and addressed to the "Chairman of the Gas Committee," must be received by Four o'clock p.m., on Tuesday, the 4th of June next.

The lowest or any tender will not necessarily be accepted.

No. 2.

For the Sale by them of the GAS TAR and AMMONIACAL LIQUOR produced at their Works for One, Two, or Three years, from the 1st of July next, at per Ton of 2240 lbs. at such Works.

Sealed tenders, endorsed "Tender for Gas Tar and Liquor," and addressed to the Chairman of the Gas Committee, must be received by Four o'clock p.m., on Tuesday, the 4th of June next.

The highest or any tender will not necessarily be accepted.

Further particulars may be obtained from the undersigned.

By order of the Commissioners,

C. HENSHAW, Clerk.

Public Offices, Leek, May 15, 1878.

TO TAR DISTILLERS AND MANUFACTURING CHEMISTS.

THE Directors of the West Kent Gas Company invite TENDERS for the whole of the AMMONIACAL LIQUOR and Surplus TAR produced at their Works at Erith and Crayford, for One, Two, or Three years, as may be agreed upon.

Tenders will be received up to the 31st inst., and the Directors do not bind themselves to accept the highest or any tenders. Quantity say 20,000 Gallons of Tar at each Works.

At Erith Works the Tar and Liquor will be pumped into Contractor's barges, at Crayford Works filled into Contractor's casks.

Tenders, endorsed separately "Tender for Tar," "Tender for Ammoniacal Liquor," to be forwarded to me, the undersigned, at the Company's Offices, 237, Southwark Bridge Road, London, S.E.

R. PEARS KEYS, Secretary.

TAR AND AMMONIA WATER.

TO BE DISPOSED OF, the Tar and AMMONIA WATER produced at the Merthyr Tydfil Gas-Works.

The Directors of the Company will be glad to receive offers to purchase the same for a period of Three or Five years.

Particulars as to quantity, &c., may be obtained of the undersigned.

The right to accept or refuse the highest or any offer is reserved.

By order,

J. L. COCKER, Secretary and Manager.

Gas Office, Merthyr Tydfil, Glamorganshire, May 20, 1878.

TO BUILDERS AND GASHOLDER MAKERS.

THE Briton Ferry Local Board invite TENDERS, with drawings and specifications, for the following Contracts:—

Contract No. 1.—To Supply and Erect a Gasholder, 55 ft. diameter and 16 ft. deep, with 8-in. Inlet and Outlet Pipes complete; and for Supplying Annular Condensers, two 8 ft. square Purifiers, Hydraulic Main, &c.

Contract No. 2.—Comprises Brick Tank for Gasholder, addition to Retort-House, Purifiers Shed, Coal Shed, &c.

Printed particulars and forms of tenders may be obtained on application to Mr. William Chayne, Engineer, Gas-Works, Briton Ferry.

Tenders, properly endorsed, must be sent in to me on or before Tuesday, the 11th day of June next.

The lowest or any tender not necessarily accepted.

JAMES KEMPTHORNE, Clerk.

Duffryn Chambers, Neath.

TO ENGINEERS, IRONFOUNDERS, AND OTHERS.

THE Atherton Local Board invite TENDERS for the Manufacture and Erection of a Wrought-Iron ROOF of a Retort-House, and the IRON-WORK of a Retort-Bench, &c., at their Gas-Works, Atherton.

Drawings and specifications may be seen, and quantities had, at the Gas-Works, Atherton, or at the Office of the Engineer, Mr. Thomas Newbigging, 5, Norfolk Street, Manchester, on payment of one guinea (to be returned on receipt of a *bonâ fide* tender), on and after Monday, the 27th inst.

Tenders, endorsed "Retort-House Roof," &c., to be sent to the undersigned, on or before Monday, the 10th of June.

The Board do not pledge themselves to accept the lowest or any tender.

DANIEL SCHOFIELD, Clerk.

Local Board Office, Atherton, May 23, 1878.

THE MAGHULL GAS COMPANY, LIMITED.

THE Directors of the above Company are prepared to receive TENDERS for the Erection of GAS-WORKS at Maghull.

Contract No. 1.—Erection of Manager's House, Coal Stores, Retort-House, Purifier-Shed, and other Buildings.

Contract No. 2.—The excavation and brickwork of a Gasholder-Tank.

Contract No. 3.—All Ironwork, Retorts, Fittings, Hydraulic Main, Condensers, Washer, Purifiers, Gasholder, &c., and all connecting Pipes and Valves.

The drawings and specifications may be seen on and after the 27th inst., and tenders must be delivered at the Secretary's Office, Maghull, Liverpool, on or before the 3rd of June.

Further particulars may be obtained from Mr. J. T. HALL, Engineer, Prescot.

The Directors do not bind themselves to accept the lowest or any tender.

By order.

Maghull, Liverpool, May 11, 1878.

TO GAS ENGINEERS AND IRONFOUNDERS.

THE Directors of the Thrapstone Gas Company are prepared to receive TENDERS for a Condenser, Scrubber, Purifiers, Valves, and Connections, according to plans and specifications which may be seen on application to Mr. William Ibbs, Secretary, Thrapstone. Particulars may also be obtained on application to Mr. John Esmson, C.E., Northampton.

Tenders endorsed "Tender for Apparatus," addressed to Mr. William Ibbs, to be delivered on or before Saturday, June 1.

The Directors do not bind themselves to accept the lowest or any tender.

WILLIAM IBBS, Secretary.

May, 1878.

BURTON-ON-TRENT GAS-WORKS.

CONTRACTS FOR IRON ROOFING, RETORT FITTINGS, PURIFIERS, AND OTHER APPARATUS.

THE Commissioners for Executing the Town of Burton-upon-Trent Act, 1853, are prepared to receive TENDERS for the Construction and Erection of certain Wrought-Iron ROOFING, required for the Extension of their Gas-Works at Burton-on-Trent, comprising Roofs of 52, 35, and 30 ft. spans or thereabouts; also for the Gas-Making and Purifying Apparatus, comprising 56 Retort Mouthpieces, and the Furnace Fittings and Ascension-Pipes connected therewith; two Hydraulic Mains; and other materials and apparatus.

Drawings may be seen, and specification and form of tender may be had, on application at the Office of Mr. Mudie, the Manager of the Commissioners Gas-Works, Burton-on-Trent, on and after Wednesday, the 29th day of May inst., and at the Office of Messrs. Thomas and Charles Hawksley, Civil Engineers, 30, Great George Street, Westminster, S.W., and tenders must be delivered to me at the Offices of the Commissioners, on or before 10 o'clock a.m. of Wednesday, the 12th day of June next.

The Commissioners do not pledge themselves to accept the lowest or any other tender.

By order,

T. N. WHITEHEAD, Clerk to the Commissioners.

Burton-on-Trent, May 18, 1878.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

(INCORPORATED BY ACT OF PARLIAMENT.)

The HALF-YEARLY ORDINARY MEETING of the Imperial Continental Gas Association was held at the City Terminus Hotel, Cannon Street, London, on MONDAY, the 27th inst.,

SIR JULIAN GOLDSMID, Bart, M.P., Chairman, when the following resolutions were passed:—

Resolved unanimously—"That the Report upon the affairs of the Association now read be received, adopted, and entered on the minutes."

Resolved unanimously—"That a dividend of £2 10s. per share, and a bonus of 10s. per share, be declared upon the 56,000 shares of the Association for the half year ended the 31st of December last, and that the said dividend and bonus be payable, free of income-tax, on and after the 15th of June next.

Resolved unanimously—

"That Thomas Henry Goodwin Newton, Esq., be re-elected a Director of the Association."

"That Colonel Wilkinson be re-elected a Director of the Association."

"That Philip Twells, Esq., M.P., be re-elected a Director of the Association."

"That Thomas Newton Stokes, Esq., be re-elected an Auditor of the Association."

"That the cordial thanks of the meeting be given to the President, Chairman, and Directors, for their able management of the affairs of the Association, and to the Chairman for his conduct in the chair this day."

Upon the motion of the Chairman, Sir Julian Goldsmid, Bart, M.P., a vote of thanks was also given to Mr. G. W. Drory, the General Superintendent of the affairs of the Association on the Continent, and to the Agents, Engineers, and other Officers of the Association.

ALBERT F. JACKSON, Secretary.

By order of the Board.

30, Clement's Lane, Lombard Street, London, E.C., May 28, 1878.

COAL CONTRACT.

THE ABINGDON GASLIGHT AND COKE COMPANY, LIMITED.

THE Directors of the above Company are prepared to receive TENDERS for the Supply of 1500 Tons of GAS COAL, the deliveries to extend to One year, from the 1st day of August next.

Tenders, quoting price per Ton, delivered free at the Great Western Railway Station, Abingdon, must be delivered before the 4th of June next to the Secretary and Manager, Mr. JOHN ELY, Gas-Works, Abingdon, from whom any further information may be obtained.

Abingdon, May 10, 1878.

TAR AND AMMONIACAL LIQUOR CONTRACT.

THE ABINGDON GASLIGHT AND COKE COMPANY, LIMITED.

THE Directors of the above Company are prepared to receive TENDERS for the Surplus TAR and AMMONIACAL LIQUOR produced at their Works (which can be delivered into boat on the River Thames) for One or Two years.

Tenders, quoting price per Ton, must be sent in by the 4th of June next to the Secretary and Manager, Mr. JOHN ELY, Gas-Works, Abingdon, from whom any further information may be obtained.

Abingdon, May 10, 1878.

BOROUGH OF BARROW-IN-FURNESS.

TO COLLIERY PROPRIETORS.

THE Gas and Water Committee invite TENDERS for the Supply of GAS COAL and CANNEL for a term of One, Two, or Three years, from the 30th day of June next.

Quantity required per annum, about 7000 Tons of Coal, and 2500 Tons of Cannel.

Further particulars may be obtained on application to Mr. A. C. Fraser, Manager, Gas and Water Works, Barrow-in-Furness.

Tenders, properly endorsed, must be sent to these Offices, addressed to "The Chairman of the Gas and Water Committee," on or before Tuesday, the 11th of June next.

By order,

C. F. PRESTON, Town-Clerk.

Municipal Offices, Barrow-in-Furness.

SULPHATE OF AMMONIA PLANT.

THE Plant erected, or Plans supplied for above, on the newest and most improved method, at less than half the cost of other plans, gives better results, requires less labour, and allows no gases or offensive smell to escape. Reference kindly permitted to manufacturers as to efficiency and cheapness of plant, &c.

For particulars, address JOHN G. HARVEY, Chemical Works, Little Island CORK.

GAS COAL.

THE MIRFIELD COAL COMPANY are supplying GAS COAL of the best quality to trucks at their siding. This Coal contains 18 per cent. of Cannel, and, as analyzed by Mr. James Paterson, of Warrington, yields 12,600 *cubic feet of* 16·67 *candle gas, with* 1430 *lbs. of good Coke, per ton.* Ash in Coke, 1·88.

Apply to the MIRFIELD COLLIERY, Mirfield, NORMANTON.

THE BROUGHTON COAL COMPANY,

COLLIERIES, NEAR WREXHAM,

Are prepared to Supply their excellent GAS COAL on very favourable terms.

This Coal yields more than 10,000 cubic feet per Ton of gas of good quality, *in practical working on the large scale.*

A large purchaser reports the coke to be clear, of a quality rarely equalled in the retort-furnace, and much liked by the stokers.

ECONOMY IN THE PRODUCTION OF GAS.

PLUTONIC CEMENT,

For Jointing and Repairing Retorts and Ovens *in* action and *out* of action.

A Pamphlet on the advantages of the above, with modes of Application, References, Prices, &c., free by post, from the Sole Manufacturer,

WILLIAM RICHARDSON, GAS AND HYDRAULIC ENGINEER,

CHARLES HENRY STREET AND BISSELL STREET, BIRMINGHAM.

GREAT SAVING OF LABOUR.

ENOCH'S PATENT

PORTABLE DRILLING-MACHINE,

Now in use by all the Principal Gas and Water Companies in the United Kingdom.

E Size, for Services in Pipes, 2 to 3 in. bore	£3 10 0
F Size, for Services in Pipes, 2 to 4 in. bore	4 0 0
G Size, for Services in Pipes, 2 to 6 in. bore, with Telescope Cramp.	4 10 0

Drills, 1s. 6d. each.

Machines sent on approval, if desired.

Prices for other Sizes and Modifications, with full Particulars and Testimonials, on application to

ALEXANDER ANDERSON.

Office: 9, London Street, E.C. Warehouse: Vine Street, Minories, London, E.

GAS PURIFICATION.

BAILES & HALLSWORTH,

CONTRACTORS FOR THE

PURIFICATION OF COAL GAS

BY THEIR

PATENT HYDRATED PEROXIDE OF IRON MATERIAL.

The Material is adapted specially for taking up sulphuretted hydrogen, and will simultaneously absorb any ammonia that may pass the scrubbers.

The spent oxide resulting from our Material is more valuable than that from natural oxide of iron, and manufacturing chemists buy it in preference.

The Material has now been in use during the past three years in most of the principal Gas-Works in Yorkshire and elsewhere.

It contains considerably less moisture than natural oxide of iron, and is much cheaper and more efficient as a purifying agent.

B. & H. are purchasers of Spent Oxide, or will take Spent in exchange for New Material.

FOR SAMPLES AND TERMS, ADDRESS—

BAILES & HALLSWORTH, COPPERAS WORKS, ARMLEY. LEEDS.

J. & J. BRADDOCK,

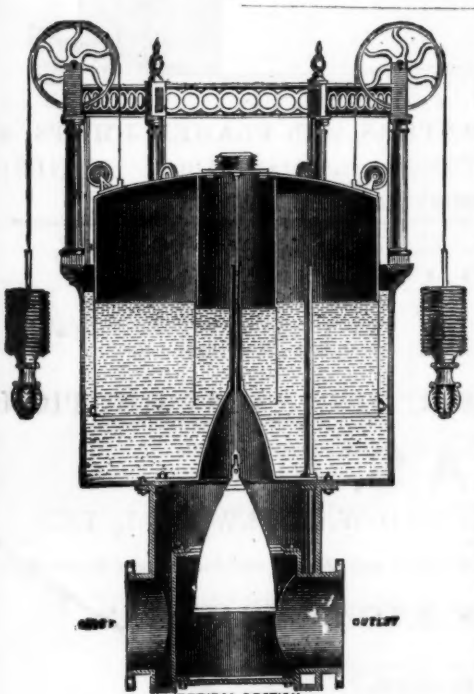
GLOBE METER-WORKS,

OLDHAM,

Beg to submit to Gas Engineers their

PATENT COMPENSATING GAS GOVERNOR,

Which is designed to give an uniform pressure at the Outlet to the Main at all draughts up to the full quantities which the Governors are made to control, such outlet pressure being less than the initial pressure.



VERTICAL SECTION

The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.

From the sectional elevation attached hereto, it will be seen that only the Gas required to operate the Bell comes in contact with the water of the tank, which water will remain comparatively sweet and free from odour. That in case of accident to the Bell, no more Gas can escape than would pass up the pipe covering the valve-rod and Bell supply-pipe.

These Governors have been made and sent out of various sizes for from 2 to 24-inch Mains, and give most satisfactory results.

They can be made with Float in the Bell, or counterpoise as per section.

GRIRDROD'S PATENT

PORTABLE PIPE SCREWING

MACHINE,

For 1 in., 1¼ in., 1½ in., and 2 in. Gas Threads, complete £7 10s.

In use at the chief gas-works, and giving great satisfaction.

For other useful goods, see Bailey's "Illustrated Inventions," post free 3s. 6d.; gratis to ledger customers.

W. H. BAILEY & CO.,

Brassfounders, Gauge njector and Tool Makers,

ALBION WORKS, SALFORD, LANCASHIRE.

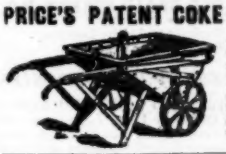
CLOTH GAS-BAGS FOR MAINS.

As supplied to the Imperial, Chartered, and other London and Provincial Gas Companies. Bellows and Valves for inflating Well Dresses, Stokers Gloves, India-Rubber Suction and DeliveryHose,Gas-Tubing, Leather, India-Rubber, and Gutta-Percha Machine-Bands,Sheet and Washers, and Steam Joints.

T. BUGDEN, Manufacturer,

107, GOSWELL ROAD, LONDON, E.C.

PRICE'S PATENT COKE & COAL BARROW



effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

TORBAY AND DART PAINT COMPANY, LIMITED.

WORKS:

DARTMOUTH & BRIXHAM (TORBAY) DEVON.

OFFICES:

3, GREAT GEORGE STREET, WESTMINSTER, LONDON, S.W.

SOLE PROPRIETORS AND MANUFACTURERS OF

WOLSTON'S CELEBRATED

TORBAY IRON PAINTS.

TRADE MARK

These Paints have been for many years extensively used in Her Majesty's Royal Dockyards, Woolwich Arsenal, the Shorncliffe and Curragh Camps, War Departments, and Colonies, and are largely supplied to Railway, Harbour, and GAS COMPANIES, Shipowners, Engineering Establishments, Railway Carriage and Wagon Works, and the Paint Trade generally. They are the BEST PROTECTORS of WOOD, CEMENT, and IRONWORK, even arresting corrosion after it has set in; and their base being oxide of iron, they are free from those properties which make lead paints so destructive to iron. They do not scale or blister, are not affected by great heat, and are the only Paints which will resist the effects of sulphuretted hydrogen. Their DURABILITY and covering properties have borne the test of A QUARTER OF A CENTURY'S PRACTICAL TRIAL.

The undermentioned colours—ground in best linseed oil, and requiring only to be thinned down for use in the ordinary way—are kept in stock:—

Torbay Brown.	Torbay Red.
Dart Green.	Slate.
Dart Yellow.	Buff.
Brixham Black.	Torbay Chocolate.
Light Blue.	Cream Colour.
Dart Brown.	Dart Umber.
Imperial Stone.	Light Stone.
Bronze Green.	Salmon Colour.
Navy Green.	Lead Colour.
Carriage Red.	Dark Stone.
Light Lead.	Crystal Palace Blue.
Light Green.	Iron Grey.

All other Colours made to order.

READY-MIXED PAINTS.

A great variety of Colours ready mixed for the brush are also always kept in Stock, in 3 lb., 7 lb., 14 lb., and 28 lb. cans.

Prices and Testimonials on application.

WANTED, Readers of the Pamphlet, "Cooking and Heating by Gas; on Burners," &c. Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, Gas-Works, SYDENHAM, S.E.

WANTED, by Samuel Thompson & Co., Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.

John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

WANTED, Orders for Samples to test the superior Silkstone, Wigan, and other Gas Coals and Cannel on Sale by G. J. EVESON, Gas Coal and Cannel Contractor, BIRMINGHAM.

N.B.—Prices on personal application, or by post or telegram, on shortest notice, and prompt delivery.

SPENT OXIDE OF IRON.

WE are open to Buy this in any quantity.

Address, with price, to NICHOLSON AND SONS, Chemical Works, Munslet, near LEEDS.

PATRONIZED BY THE ROYAL ARSENAL, WOOLWICH.

FERGUSON, Builder and Contractor. Kite method of Repairing Church Spires and High Chimneys. Chimneys straightened, pointed, and hooped. Old Chimneys pulled down by a process requiring no scaffolding or stoppage of work, by competent workmen under personal supervision. For Lightning Conductors—cheapness and method of fixing—apply to C. R. FERGUSON, 12, Canal Road, MILE END.

W. LIDDALL,
PUBLIC ACCOUNTANT,
15, UNION COURT, OLD BROAD STREET, E.C.

Secretary, Brighton Gaslight and Coke Company.
Auditor, West Surrey Water Company.

NOTICE TO MANAGERS OF GAS COMPANIES.

THE LAW UNION FIRE AND LIFE INSURANCE COMPANY, of No. 126, Chancery Lane, London, grants Policies of Insurance on Gas-Works, and Buildings connected therewith, which cover risk of explosion and spontaneous ignition of Coal, on very advantageous terms. Full particulars will be sent post free on application to FRANK M'GEDY, Secretary.

126, Chancery Lane, London.

A PAMPHLET ON DIP-PIPES, &c., post free 6½d., on application to W. WHITE, Gas-Works, Abersychan, MON. See Reviews in the *Gas Trade Circular and Review*, March 29, 1878, and *Design and Work*, March 30, 1878.

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S. C. & Sons undertake the entire Erection of New, or Remodelling of existing Gas-Works in any part of the World, including small Works for MANSIONS, FACTORIES, &c., or Works of the largest extent (are now constructing the largest Gasholder yet erected); also the Supplying and Laying of MAINS.

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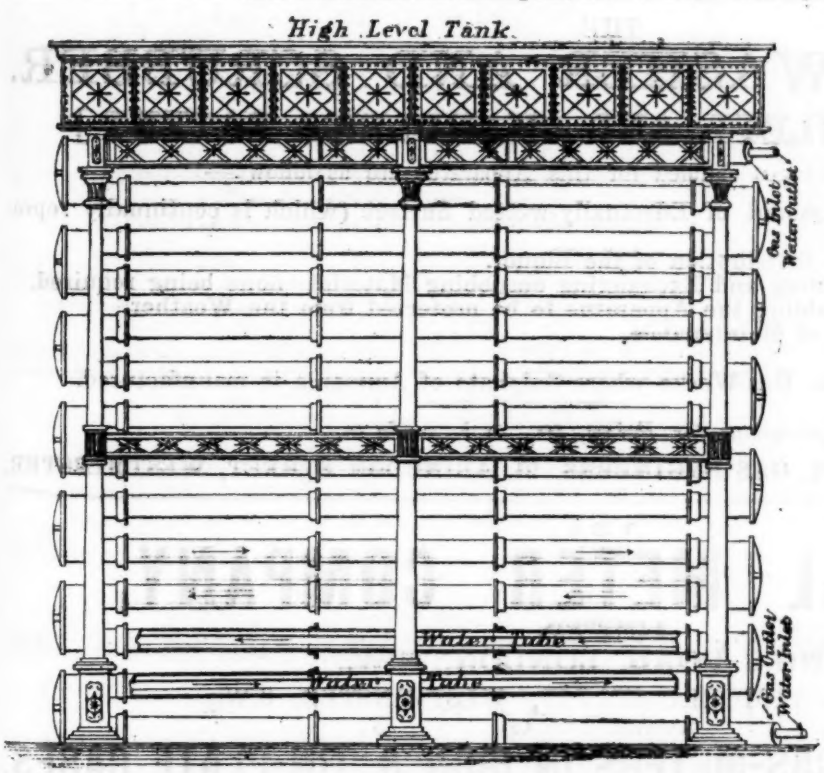
AND

CUTLER'S PATENT GAS-WASHER.

(For Illustration and Description, see "Journal" for May 14, page 777.)



Description of Morris & Cutler's Patent Condenser.

The Condenser may consist of pipes arranged in tiers as shown, or in any other form most convenient to the site available, each tier being connected with special connexions, and containing within same either one or more coils of smaller pipe through which water is passed, being supplied from any convenient source of supply, the water passing in an opposite direction to the gas, so that the coldest water is at the gas outlet. The power of the Condenser can be regulated precisely in proportion to the quantity of water allowed to pass through, which is not in any way contaminated, but simply heated by the hot gas, and advantage can be taken of its being at a high level to carry it to a high-level cistern, from whence it can be used for supply to boiler or any other purpose. (The Condenser itself may form the support for a high-level cistern as illustrated.) By an arrangement of valves the water may be shut off, and an air orifice opened, when air will pass through instead of water, or both air and water can be shut off. The power of the Condenser is, therefore, entirely under control.

The Condenser may be seen in operation at the Brentford Gas-Works.

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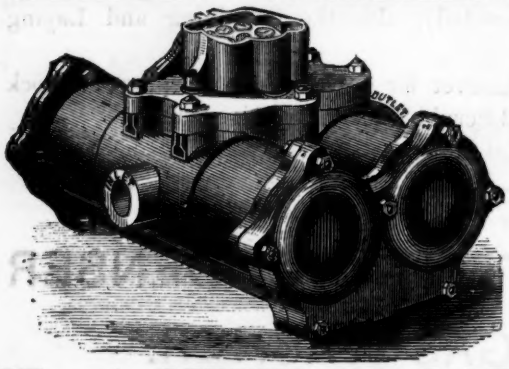

The above Company, having purchased the patent rights of the Union Water-Meter, are prepared to receive and execute orders for their Patent Positive Meters, which are simple and compact.

Upwards of 20,000 of these Meters are in successful operation in the principal cities of the United States, and have also been tested and approved by some of the leading Engineers in this country.

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STANDARD WASHER AND SCRUBBER.

[KIRKHAM, HULETT, AND CHANDLER'S PATENT.]

Some of the advantages claimed for this Apparatus are as follow:—

The Exposing of a large Amount of Effectually-wetted Surface (which is continually reproduced) to act upon the Gas.

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Saving of Expense in Providing and Exchanging Scrubbing Material—none being required.

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Economy of First Cost and of Maintenance.

It works without Pressure.

It is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured.

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NOTICE.

THE GAS & WATER COMPANIES DIRECTORY, 1878.

(WATER SECTION.)

The Editor will feel greatly obliged if Secretaries and Engineers would fill up, and return to him at once, the forms sent them, as the work is now going to press. If any have not received Forms, they will be forwarded immediately, on application to the Editor,

CHARLES W. HASTINGS,
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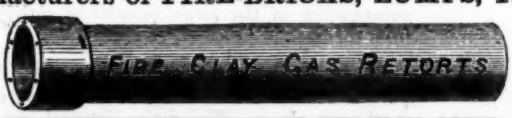

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Associate of the Society of Accountants in England, Publisher of the "Gas Companies Expenditure Journal,"
Begs to announce his REMOVAL from Skinner's Place, Size Lane, to
No 2, ST. GEORGE STREET, WESTMINSTER.

Mr. ROBERT DEMPSTER, Sen.,

CONSULTING GAS ENGINEER,
Of Messrs. Robert Dempster and Sons, Rose Mount Gas Engineering Works,
ELLAND, near HALIFAX,
May be consulted on all matters connected with Valuations, Arbitrations, and Parliamentary Applications connected with Gas-Works. Our R. D., Sen., having been engaged on extensive Arbitration Cases, which, combined with his experience in Construction and Contracting, his knowledge of Engineering and Valuations, is both extensive and reliable.

REMOVAL.
CHARLES HEISCH, F.C.S., Analytical and Consulting Chemist, Superintending Gas Examiner to the Corporation of London, &c., &c., has REMOVED from 8, Savage Gardens, to 79, MARK LANE, where he may be consulted as usual.

JOHN ROMANS, C.E., F.G.S.E.,

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Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.
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WILSON'S
SAFETY
AUTOMATIC PRESSURELESS DIP-PIPE,
SELF-CLEANING HYDRAULIC MAIN.
See Illustration and Description in JOURNAL OF GAS LIGHTING, *Dec.* 4.

Improved SCRUBBER, with Self-Acting Water Distributor.
Improved HYDRAULIC CENTRE-VALVE to work three or four purifiers.
Improved HYDRAULIC LIFT, by which one man can raise and remove purifier-covers of any size.
Plans and specifications prepared for New or for the Remodelling of existing Gas-Works.
Special Designs for Gas-Works for Tropical Climates.
Particulars, &c., to be had of the Patentee, Inventor, and Manufacturer, W. P. WILSON, Consulting Engineer, 80, Cannon Street, LONDON, E.C.

C. & W. WALKER,
8, FINSBURY CIRCUS,
LONDON, E.C.

MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

By some important improvements recently patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used, the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

It is to be particularly noted that the important results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

Fifty million cubic feet of gas per 24 hours are purified from ammonia by these Patent Scrubbers in a winter's day in the gas-works of London, where the purity of gas supply is the highest in the world, under the chemical restrictions of the Board of Trade.

Generally, wherever a high standard of purification is maintained in the chief cities and towns of the British Provinces and of Europe, these Scrubbers have become established.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals, generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

They contain their own engine power, requiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

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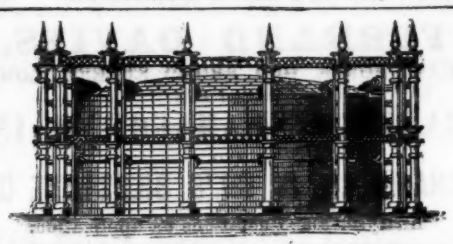

STOCKTON ON TEES.

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GAS APPARATUS OF EVERY DESCRIPTION,

Including Improved

Retort-Lids, Boilers, Cast and Wrought Iron Tanks, Iron Roofing, Bridges, Girders,

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N.B.—Estimates for all Gas Plant and Remodelling supplied on application.

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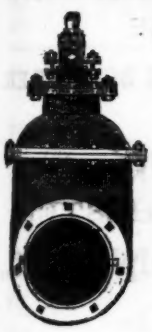
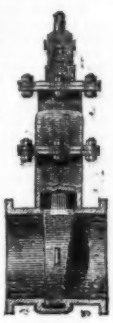


C. & W. WALKERS' DOUBLE-FACED GAS-VALVES.



These solidly constructed double-faced Gas-Valves have taken the place of the old system of the light, single-faced disc, which is too uncertain and unreliable in large bores.

They are guaranteed absolutely gas-tight. They are very massive and rigid, and by improved modes of manufacture they are produced at very little excess in cost over the old light, weak system, which is liable to spring and bend, and become leaky.

The Valve is a rigid wedge of solid cast iron, having two perfectly scraped surfaced facings fitting between the two on the body, which are also surfaced.

A spring in two short halves, and, therefore, not liable to break, is used only for scraping the front facing clean.

The front facing is vertical; the back facing forms the wedge.

At a slight additional expense both flanges are faced to bolt to main-pipes.

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IMPROVED COMPENSATING GAS-METER.

HUNT'S PATENT.

This Meter supplies a want long felt, by putting an end to the loss sustained by Gas Companies through the overworking of their Meters.

These Meters can now be supplied in either TIN-PLATE or CAST-IRON CASES, and OLD METERS converted to this plan. GAS COMPANIES and CORPORATIONS will find it to THEIR ADVANTAGE to adopt these Meters.

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Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

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OLD WEMYSS CANNEL

Yields 13,320 cubic feet of 32·5-candle gas per ton.

Prices and full Analyses on application.

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POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

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The Subscriber is prepared to contract for the supply of all the principal SCOTCH CANNEL COALS. Prices and Analyses of the various Coals will be forwarded on application.

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T. Stone, Esq., of Weymouth, writes on Nov. 17, 1876: "I have used about 12,000 tons of this Coal, with, I think, the best possible results, although not always under the most favourable circumstances. My Coal account made up to Midsummer last showed a makeage of 10,524 cubic feet per ton of 14¼-candle gas, and not a hundredweight of Cannel used. This statement would, I know, be incredible to many men, and may provoke the remark, 'How much of it is paid for?' For the gratification of such, I have to say that, of the above quantity, 9866 cubic feet per ton of Coal carbonized were brought to charge and duly paid for, with the exception of about 6s. per cent. for bad debts. The coke is of excellent quality. The above facts I hold to be a greater recommendation to your Coal than any words of mine could be."

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AGENT FOR

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AND

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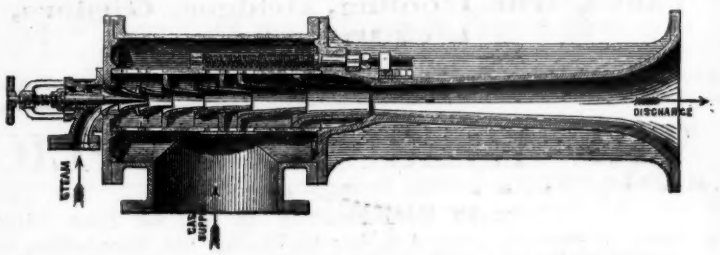
COAL OWNERS AND FACTORS,

Supply to any Railway Station the best descriptions of Gas Coal, Nuts, and Cannel.

PRICES ON APPLICATION.

HEAD OFFICE: 79, MARK LANE, LONDON.



KÖRTING'S STEAM-JET GAS-EXHAUSTER.

IMPROVED CLELAND'S PATENT.

UPWARDS OF 250 IN USE.

CLELAND'S PATENT CONDENSER AND STEAM SCRUBBER.

FOR PARTICULARS, APPLY TO

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GERALD J. TUPP, 8, John Street, Adelphi, W.C., LONDON,

SOLE AGENT FOR ENGLAND AND WALES.

THE WIGAN COAL & IRON COMPANY,

LIMITED.

DISTRICT OFFICE: 97, NEW STREET, BIRMINGHAM; AGENT: W. M'GOWAN;

Supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, &c.

N.B.—The Wigan Coal and Iron Company, Limited, are exclusive owners of the well-known HAIGH HALL AND KIRKLESS HALL GAS COAL COLLIERIES.

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GAS COAL

Of superior quality, delivered in trucks at any Railway Station in England, or shipped on board at Hull, Grimsby Docks, or Barrow-in-Furness.

Purified gas per ton of coal in cubic feet (average)	10,775
Illuminating power in candles	14·71
Weight of coke in lbs. per ton of coal	1,502

ANALYSIS AND PRICES ON APPLICATION TO

Mr. EDMUND TAYLOR, Secretary,

ALBERT COLLIERY, NEWBOLD, NEAR CHESTERFIELD.

THE SILKSTONE & DODWORTH COAL & IRON COMPANY, LIMITED,

DODWORTH, BARNSLEY.

BENJAMIN WHITWORTH, Esq., M.P. . . . . Chairman.
Mr. RICHARD HARTLEY . . . . . Managing Director.

REAL OLD SILKSTONE GAS COAL.

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"This Coal possesses remarkable qualities as a gas and coking coal, and appears SECOND TO NONE IN THE KINGDOM. It contains the large quantity of 699 lbs. of illuminating matter, and 1498 lbs. of coke to the ton, and produces **12,240** cubic feet of 16·66 candle gas."

The above Company are raising nearly a thousand tons of the Real Old Silkstone Gas Coal per working day.

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HYDRATED PURIFYING MATERIAL.

Samples on application.

MESSRS. SPENCE BROS., LIMITED,

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And to treat, by Purchase or Exchange, for Spent Oxide.

PRICES ON APPLICATION.

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THORNCLIFFE IRON-WORKS AND COLLIERIES,

NEAR SHEFFIELD.

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The various descriptions of Gas Coal produced from the above Collieries possess an unequalled reputation, combining in a large degree the constituents essential for the production of the best quality of Coke and Gas of a high illuminating power.

A recent extensive development of the Collieries enables us to offer increased supplies.

JAS. PATERSON, Esq., of Warrington, after testing various qualities of our Coal, has sent the following testimony of their merits:—

"Warrington Gaslight and Coke Company,
Offices, Mersey Street, Warrington, April 23, 1877.

"MESSRS. NEWTON, CHAMBERS, AND CO.,

"GENTLEMEN,—After carefully testing the various samples of Gas Coals sent from your Collieries for analysis, I have pleasure in reporting them as belonging to the highest class of Gas and Coking Coals.

"The average of Nine samples gives a yield of **12,500** cubic feet of **15½**-Candle Gas, being equivalent to **664** lbs. of sperm per ton, and **1420** lbs. of fixed carbon of a very superior quality. All the samples bear a close relation to each other in value.

"Yours truly, "JAMES PATERSON."

Full particulars will be sent on application to us—address as above.

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DRY GAS-METERS,

PRIZE MEDALS.
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(INVENTED & PATENTED IN 1844,)

COMBINING ALL THE LATEST IMPROVEMENTS,

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STATION-METERS, AND GOVERNORS.

METERS, BOXES, REGULATORS, AND ALL REQUISITES FOR PUBLIC LIGHTING.

TESTING APPARATUS for all purposes relating to Gas, &c.

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CONSUMERS IMPROVED WET GAS-METERS,

THE UNVARYING WATER-LINE GAS-METERS,

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STATION-METERS, ALL SIZES, up to 15 feet Square, with PLANED JOINTS;

Experimental Meters, Photometers, Pressure-Gauges, Governors, Test Holders, &c., &c.

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Effecting an IMMENSE SAVING in the cost of discharging Coals from Vessels, Barges, &c.

HYDRAULIC RAMS FOR LIFTING AND LOWERING PURIFIER COVERS.

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GLASGOW OFFICES:
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